AMERICAN MATHEMATICAL SOCIETY

AMS Style Guide

Journals

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AMS American Mathematical Society

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AMS American Mathematical Society

This style guide evolved from Ellen Swanson's seminal work on typesetting mathematics, *Mathematics into Type*, and the American Mathematical Society (AMS) practice of mentoring its copy editors.

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Acknowledgment is gratefully made to the Society for Industrial and Applied Mathematics (SIAM) for allowing liberal use of its style guide as a basis for this work. Any copy editor using both AMS and SIAM style guides is warned that they describe very different styles, no matter the superficial similarities.

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10 9 8 7 6 5 4 3 2 1 22 21 20 19 18 17

Contents

Preface vii

Part 1. Structure

Introduction to Part 1 3

Chapter 1. The Basics of Copyediting for the AMS 5
§1.1. Approaching the paper 7
§1.2. The copyediting process 7
§1.3. Author queries 10
§1.4. Advice we still like 10
§1.5. Miscellaneous hints 12
§1.6. Resources 12

Chapter 2. Top Matter, Running Heads, and End Matter 15
§2.1. Top matter 15
§2.2. Running heads 21
§2.3. End matter 21

Chapter 3. Section and Subsection Heads 27
§3.1. Heading styles 27
§3.2. Numbering 29
§3.3. Text callouts 30

Chapter 4. Enunciations 31
§4.1. Enunciations 31

Chapter 5. Footnotes 37

Chapter 6. Lists 39
§6.1. Numbering 39
§6.2. Type style and arrangement 40
§6.3. Punctuation and capitalization 41
§6.4. Text callouts 41
§6.5. List examples 42

Chapter 7. Figures 45
§7.1. Numbering 45
§7.2. Captions 46
§7.3. Permissions 47
§7.4. Figure placement and text callouts 48
§7.5. Sizing and altering figures 48
§7.6. Landscape figures 49
§7.7. Some examples 49

Chapter 8. Tables 53
§8.1. Numbering 54
§8.2. Captions 54
§8.3. Permissions 55
§8.4. Table placement and text callouts 55
§8.5. Sizing and altering tables 56
§8.6. Landscape tables 56
§8.7. Some examples 57

Chapter 9. Appendices 61
§9.1. Form 61
§9.2. Text callouts 62

Chapter 10. References 63
§10.1. Reference checking 63
§10.2. Reference examples 65
§10.3. Reference citations 66

Chapter 11. Corrigenda and Errata 67
§11.1. Title and running heads 68
§11.2. Abstract and other top matter 68

Part 2. Editing and Style

Introduction to Part 2 71

Chapter 12. Editing Text 73
§12.1. Basic editing 74
§12.2. Mathematical symbols in text 75
§12.3. Type 76
§12.4. Capitalization in lists 79
§12.5. Wording 80
§12.6. Acronyms 83
§12.7. Punctuation 84
§12.8. Quotations 95
§12.9. Gender-neutral and bias-free language 95
§12.10. Miscellaneous applications 96

Chapter 13. Editing Mathematics 97
§13.1. Numbers 97
§13.2. Variables 98
§13.3. Standard abbreviated forms of mathematical expressions (inf, max, min, etc.) and functions (sin, cos, tan, etc.) 98
§13.4. Punctuation 100
§13.5. Line dots (ldots) and centered dots (cdots) 102
§13.6. Fences 103
§13.7. Sums ($\sum$) and products ($\prod$) 104
§13.8. Unions ($\cup$, $\bigcup$) and intersections ($\cap$, $\bigcap$) 105
§13.9. Integrals 106
§13.10. Fractions 107
§13.11. Cases 109
§13.12. Matrices 110
§13.13. Diagrams 111
§13.14. Equation numbers 112
§13.15. Spacing in displays 113
§13.16. Breaking equations in text 114
§13.17. Breaking and aligning equations in displays 116

Part 3. Appendices

Appendix A. Functions and Operators Set in Roman Type 123

Appendix B. Some Mathematician Names 125

Appendix C. Common Abbreviations and Latin Expressions 133

Appendix D. Nomenclature 135

Appendix E. Variables in Various Fonts and Languages 139

Appendix F. Commonly Confused Words 141

Appendix G. Sample Edited Article 143

Bibliography 159

Index 161

Preface

Each year AMS staff and freelancers edit and publish well over 1,000 journal articles and 80 book volumes, totaling some 60,000 pages of mathematical research. The "raw material" is submitted from every active area of mathematics, and it is funneled through the peer-review process for each journal or book series. These accepted works are then submitted for publication in one of the AMS's many journal or book series. Prior to any work being accepted, the author has likely had to address a number of comments from journal or book series editors. These comments can be anything from suggestions for substantive changes in the mathematics to requests for ESL (English as a second language) problems to be resolved. And that all happens before a copy editor touches the manuscript.

This research is the product of deep expertise—and widely varying levels of writing ability. Additionally, mathematics does not only exist in a lab—it is a vibrant and specific language of mathematical symbols as well as letters from different alphabets. Each mathematician will have developed a unique style of writing that has been refined through years of communicating results with colleagues. Mathematicians are able writers, some are even exceptional. In other words, this is a tough crowd for the aspiring copy editor.

For a copy editor, learning to work with mathematical copy involves understanding how mathematical notation equates to different parts of speech, how mathematics is presented (both in text and in display), what the nomenclature is, etc., in addition to knowing copyediting practices and learning AMS style.

An unexpected publishing cycle

In the past the AMS relied on training its copy editors through mentoring. Each accepted paper or book was typeset at the AMS, and then two proofreaders would sit together while one read the author's original to the other, who marked the AMS copy for errors. A spoken language for reading mathematical symbols was known to generations of AMS copy editors and proofreaders. It was an extremely efficient system: train new copy editors and pass on the mentor's knowledge of AMS style and general copyediting practices, and at the same time proofread newly typeset copy.

In 1971 Ellen Swanson, former director of the AMS editorial staff, wrote *Mathematics into Type*. Her original work formalized type specs for handling mathematical symbols, equation breaking across lines, protocols for the use of fonts, approaches to sentence structure and reference style, production processes, etc. This small authoritative book became—and remains—the guide recommended by *The Chicago Manual of Style* for anyone looking to typeset mathematics properly.

With the invention of TEX and, later, the wide acceptance of LATEX as the best platform for typesetting mathematics, the detailed specs for symbols and their spacing became part of the code. Thanks to this improvement, many fewer corrections had to be made. With this streamlining and better prepress processing of electronically submitted manuscripts, the role of the copy editor changed dramatically. In expectation of deep cost savings, more and more of what the author submitted was not changed whenever it could be let go. The AMS referred to this as "editorial lite", and it became the new standard for editorial practice: if it isn't wrong, let it stand.

This practice did not hold up, however. The AMS realized that, unless you could mentor your copy editors and foster an understanding of which edits are important to the AMS and its authors, it was nearly impossible to uphold any level of consistency. A copy editor has to understand all the rules before knowing where to break them. Many attempts at hiring freelance copy editors ended in confusion, since the essence of what matters to the AMS is learned over time. It also became clear that senior editorial staff were quietly adhering to traditional editorial practices while upholding the spirit of less editorial intervention. This "less is more" approach was popular with AMS authors and membership, though they remained quick to point out errors.

It was clear that a combination of traditional copyediting practices as well as instruction in how to read mathematics as parts of speech was the only path to keeping copy editors trained consistently. Additionally, as the copyediting function is becoming more "decentralized" (that is, we need to hire and train freelancers, not just in-house staff), creating a method for

mentoring was essential. This style guide is intended to function as an "online mentor", thus closing the circle in a very twenty-first century way.

Into the breach!

Editorial work is most often noticed *in the breach*—if you miss something, someone else will catch it and let you know. The corollary to this is that the best editorial work is completely invisible: a properly rendered sentence may well have had some editorial help that allowed it to flow seamlessly, to transmit its message and not trip up the reader with awkward phrasing. And the copy editor must never, ever impose his or her style on the author. Again—*with emphasis*—invisibility is our goal.

The copy editor's job is to ensure accuracy and readability while maintaining the author's intent and wording, and to ensure AMS style. This is a balancing act, and with such diverse writing styles, we find that flexibility is valued over dictates. Copyediting is a deep discipline, one that is often overlooked: something that tends to be invisible when it is good does not call attention to itself. But authors appreciate it when we catch an error, when we smooth out an awkward phrase, when we explain why a change was made. This is the "value added" to work that carries the AMS imprimatur.

This style guide contains a load of information—it is a compilation of decades of experience and AMS best practices. The copy editor should expect it to take quite some time to master. Given the amount of material we are publishing and the level of quality we plan to maintain, we hope that copy editors reading this will realize it's worth their time. We suggest keeping this guide and *The Chicago Manual of Style* readily available while copyediting.

AMS style is based upon Ellen Swanson's *Mathematics into Type* and *The Chicago Manual of Style*, along with dashes of Strunk and White's *Elements of Style* and the ever-useful *Words into Type*. The AMS prefers a current approach to spelling but a more conservative approach to usage. Accordingly, we use *The Merriam–Webster Dictionary* for spelling, but we follow *The American Heritage Dictionary of the English Language* for its excellent usage guidance. Our notions of best practices are based on our experience in preparing material for publication within the AMS production system and answering questions from authors, compositors, and production staff.

Throughout this style guide there are notes intended to help the copy editor develop an understanding of what *should* be changed, what *may* be changed, and what *must not* be changed. These notes appear in every chapter of Parts 1 and 2, and we have added many specific references to [**CMS16**], [**MIT**], [**S-W3**], and [**WIT**].

To help the copy editor master this material, we have broken the information into functional parts. Part 1 outlines the AMS work process and the components of an AMS journal paper. Part 2 is all about editing—both text and mathematics. The final part contains appendices with mathematically specific information. All three parts have material that the copy editor will need to reference on a regular basis—so set your bookmarks. Finally, we have tried to index the material within this guide to be intuitive and effective.

This is a "living document", and the AMS invites you to email queries and updates to `styleguide@ams.org`. We anticipate regular revisions.

Acknowledgments

It has been understood for some years now that we needed to codify AMS editorial practices and style in order to pass it on. At this writing we have people who have spent their entire careers at the AMS—one for 37 years, another for 42 years, and even a senior LaTeX guru who has been here for almost 55 years. Mary Letourneau has watched the AMS production process move from linotype to LaTeX, and she has trained countless new editorial staff. Her combined mathematical and editorial expertise have made her an arbiter among highly trained staff and a favorite with authors.

In our search for an appropriate model for the *AMS Style Guide*, we reviewed the style guide written by the editors at the Society for Industrial and Applied Mathematics (SIAM). Their guide resonated with us, and we have worked extensively with it as the basis for this one. The *AMS Style Guide* differs from the *SIAM Style Guide* in substantive ways—our styles and work processes are unique to our organizations. But we would not have been able to get to this point as quickly and efficiently if it were not for their openness to share material. We thank them effusively.

Along the way, a superb but anonymous copy editor spent some time reviewing this manuscript. Her corrections ranged from the substantive to the mundane, but they made this a better guide. We thank her both for her good work and for reminding us of the value of solid copyediting. (After decades together, it was reaffirming to see that we've got like-minded colleagues outside our walls.)

Finally, we thank the AMS for funding this project and our entire department for contributing material for examples and for reviewing all those drafts.

Jennifer Wright Sharp
April 2017

Part 1

Structure

Introduction to Part 1

Part 1 addresses a variety of topics related to structural issues. Initially, we focus on our prescribed work process and the tools we have created to help copy editors produce a consistent product. After establishing these basics, we move on to discussing each element of an AMS journal paper. There are examples throughout. Many are marked with tell-tale dingbats:

✓ this symbol is a seal of approval;

ok this symbol means we can accept this variation; and

✘ this symbol indicates the variation does not meet AMS standards.

While Part 2 contains in-depth discussions of text and mathematical copyediting and style, it was not possible to present examples and details of the various elements of a paper without mentioning specific copyediting requirements for many of them. The copyediting discussed in Part 1 is intended to happen during the earliest stages of review, and it is largely mechanical. With practice, it will become reflexive.

The text block

Each finished journal is 7 × 10 inches and perfect bound (soft cover). The text block differs among the journals:

- 30 × 50.5 pica text block for AMS primary journals—*Bulletin of the AMS*, *Journal of the AMS*, *Mathematics of Computation*, *Proceedings of the AMS*, and *Transactions of the AMS*—and for *Sugaku Expositions*; and

- 32 × 52.5 pica text block for the Russian translation journals—*Theory of Probability and Mathematical Statistics* and *Transactions of the Moscow Mathematical Society*.

All nontabular material is set in a single column of left- and right-justified text. The body of the text begins immediately below the abstract or, if included, the contents of the paper. Journal text is 10pt Computer Modern,[1] roman, indented at beginning of each paragraph, and with no extra space between paragraphs. Top-level section heads and enumerated elements have white space above and below; lower-level section heads only have space above.

The body of the text

The body of an AMS journal paper has many elements:

- top matter, running heads, and end matter (see Chapter 2);
- section heads (see Chapter 3);
- text (deferred to Part 2);
- enunciations, including theorems, definitions, remarks, and proofs (see Chapter 4);
- footnotes (see Chapter 5);
- lists (see Chapter 6);
- mathematics, both in text and in display (deferred to Part 2);
- figures and tables (see Chapters 7 and 8); and
- references (see Chapter 10).

In addition, there are ancilliary elements that are regularly seen in AMS journals:

- appendices (see Chapter 9); and
- corrigenda and errata (see Chapter 11).

Each element is coded within a LaTeX file that calls in AMS style files and then outputs a paper formatted in our house style for each journal. Many of these elements have multiple jobs to do and are pulled out differently during the various production processes. We refer to these as *downstream processing needs* and, when applicable, these needs are explained.

[1] At the time of this writing, the AMS is using Computer Modern type, but it is anticipated that within the forseeable future there will be a change to STIX fonts. All font references in this version are to Computer Modern (CM).

Chapter 1

The Basics of Copyediting for the AMS

The AMS approach to publishing mathematical material is to let the author be heard. However, the AMS imposes certain constraints that make its publication style consistent across its many journals. Here we discuss where this process starts, and we will give you the necessary information and tools to make editorial choices that will be consistent with AMS requirements.

Almost all AMS papers are prepared by authors using the LaTeX mathematical typesetting system. The AMS has created style files that are used for all journal articles. Upon receipt of the author LaTeX files, the compositors add AMS style files and make only those changes necessary for the files to work within the AMS production system. This complex production system produces both print and online versions of the papers.

Once the style files have been applied, the format and page layout of the paper will match the AMS style for that journal, ideally eliminating the need for the copy editor to mark type specs or format codes. However, the copy editor will need to keep a sharp eye out for any element that does not match AMS format requirements (see Chapters 2 and 4).

The math in AMS papers is changed as little as possible. The copy editor should work under the assumption that the author has set up the equations in a certain way for a reason. Changes to the math are made only if inconsistencies in setup or format exist within a paper, or under specific circumstances described in the chapters that follow. Ask the question, "Is this clear and understandable the way it is?" If so, leave it alone.

Journal Article Checklist and Style Sheet Manuscript ID: _____

Checklist:

_____ Logo (required)	_____ Funding information (optional)
_____ Title (check linebreaks, caps, and RH)	_____ Copyright line (required)
_____ Author(s) (check RH)	_____ Running Heads (4" max, verso/recto)
_____ Communicated by (*Proceedings* only)	_____ Acknowledgments (optional)
_____ Abstract (required)	_____ About the author (optional)
_____ Received date (required)	_____ References (required)
_____ 2010 MSN class numbers (required)	_____ Affiliation (required)
_____ Keywords (optional)	_____ Email, URL (optional)

Style Sheet:

Roman	Text Dependent	Prefixes	Text Unique (capitalization, hyphenation, spelling, punctuation, etc.)

Numbering System (list all numbered elements for *at-a-glance* referencing):

FIGURE 1. AMS Journal Article Checklist and Style Sheet

1.1. Approaching the paper

This section is intended to acquaint the copy editor with how the AMS would like each paper approached. We have created a checklist and style sheet specifically for journal papers, and its purpose is to define a consistent work process among copy editors.

Each manuscript package will contain the author's accepted manuscript and the AMS output. Additionally, the manuscrupt package may include permissions, any pertinent email, and/or graphics checking output. *These materials must remain with the manuscript package.* The copy editor should review all material within the package, make any notes or queries about permissions (see sections 7.3 and 8.3), and then move ahead with the checklist.

Completing the checklist (see the top of Figure 1) should precede any copyediting of the manuscript. While checking the numbering system (see the bottom of Figure 1), the copy editor should address any incorrectly coded enunciations (theorems, definitions, remarks, proofs, and their variants), as the preparation by the compositor sometimes involves extensive reworking of the LaTeX coding in a paper (see section 1.2.1(4)). The various elements and enunciations that make up an AMS journal paper are described in detail in Chapters 2 and 4.

During the copyedit, the copy editor should *make extensive notes in the style sheet portion about those stylistic decisions that are unique to each paper* (see the center portion of Figure 1).

After the copyedited manuscript is returned, any copy editor queries as well as all author communication will be handled. Completing the documentation in the checklist and style sheet will create a definitive reference for the rest of the production cycle, and it will help ensure accuracy and conformity with AMS style.

1.2. The copyediting process

Before you start, check all materials in the manuscript package for any relevant information (e.g., any permissions issues or email about problems at submission). If you have any queries at this point, write them up for either the AMS or the author. The AMS prefers that the copy editor *explicitly* address any queries to either "AMS:" or "Author:".

We organize this process into three passes through the manuscript, each with a different focus. A detailed discussion of how to copyedit AMS papers is deferred to Part 2, which covers editing and style of both text and mathematics.

1.2.1. First pass. The first pass through a manuscript follows the top and bottom sections of the checklist (see Figure 1).

(1) Review each element of the top matter and end matter listed in the top section of the checklist. These elements are illustrated in Figures 2 and 3, and specific style guidance for these elements is given in Chapter 2.

(2) Compare the *accepted manuscript* (the version submitted by the journal editor) against the *AMS output*; these should match exactly. If they do not, let the AMS know right away—you may be asked to stop work on this paper while the differences are resolved.

(3) Check that there are the same number of references and that the citation styles match: numbered (e.g., [1], [2]), name and year (e.g., [Swanson1971]), or alphanumeric abbreviation (e.g., [NH1]).

(4) List the numbered elements in the bottom section of the checklist. There are two reasons for this:
- to evaluate the internal consistency of the numbering system;
- to create a list for at-a-glance cross-reference checking.

The following questions will help you assess the numbering system:
- Are sections, subsections, or paragraphs numbered together with theorems, remarks, and equations?
- Does the numbering system run through the paper, or does it begin anew with each section?
- Are numbered enunciations within similar constructions (e.g., theorems, lemmas, and corollaries; see Chapter 4) treated similarly?

With these questions in mind and an understanding of how these elements should appear, the copy editor is more likely to spot anomalies in the numbering system that may indicate problems. Each numbered enunciation is detailed in Chapter 4.

1.2.2. Second pass. Edit and READ the manuscript. This is a sentence-by-sentence, word-by-word, and character-by-character pass. The AMS uses the *Chicago Manual of Style*, *16th Edition* (CMS), as its primary guidance for grammar and style issues. There are a number of deviations, however, and they will be described in subsequent chapters.

(1) *Mark for AMS style, as needed*; see Chapter 12 for details. Check overall arrangement of text; see Figures 2 and 3.

(2) *Check and standardize grammar and spelling.* List all decisions on the style sheet; see Figure 1, center portion.
- Identify the treatment of compound terms—whether they are hyphenated, left open, or closed up—for conformity with AMS style and for consistency within the paper. List these on the style sheet.

- Determine abbreviated words and acronyms to be kept, made consistent, or spelled out at every occurrence. Note on the style sheet the page on which the acronym or abbreviation was first defined to ensure that it wasn't used earlier.
- Note on the style sheet any other stylistic decisions on matters that can be done in more than one way—for example, *iff* or *if and only if*; *for all* or $\forall$; references [1, 2, 3] or [1], [2], [3].
- Check overall grammar and English usage for correctness, especially for foreign authors. Note particular points that require special attention.

(3) *Check overall mathematical arrangement and notation, and mark as needed.*

- Check that all numbering issues have been resolved or identified. Check every in-text callout against the list on the numbering system portion of the style sheet; e.g., if the author refers to Theorem 2.1(i), be sure it exists in the manuscript.
- Check all mathematical expressions. Have they been handled consistently? Count ALL opening and closing fences within math expressions as you read along. If any are missing, query the author.
- Note unknown, ambiguous, or confusing symbols. Resolve ambiguities if possible; list remaining problems for author query.
- Identify patterns in notation and arrangement, such as the appearance of script or fraktur letters, use of both italic and roman variables, or notation used to signal boldface type.
- Note function names to be marked for roman type; see Appendix A.

(4) *Check positioning of tables and figures relative to their callouts.*

- Ensure a linked callout for every numbered table and figure exists.
  - Mark callouts in the right margin. Add a query for the author if any callouts are missing. This is increasingly important for hypertext versions of AMS papers.
- Confirm that all table captions appear *above* the table.
  - Mark alignment within tables if inconsistent.
  - Mark tables for type-size reduction when a table overruns the margin.
- Confirm that all figure captions appear *below* the figure.
  - Mark all figures that overrun the margins for reduction.
- Review all table and figure captions for consistency and punctuation.
- Ensure that double-numbered figures (e.g., Figure 3.1) fall within the appropriate section.

(5) *Check overall arrangement of text.* Check that all lists, subheadings, algorithms, etc., have been set properly and consistently.

(6) *Fix bad line breaks and mark any short or long pages.*

(7) *Check references.* This is described in Chapter 10.

1.2.3. Final pass. Scan the paper again for anything not caught previously.

1.3. Author queries

> *No query to an author should sound stupid, naive, or pedantic.*
> —*The Chicago Manual of Style, 14th Edition*

Ouch. But this is worth keeping in mind.

Writing an effective author query ranges from a simple "OK?" to an artfully tactful comment about a suggested change. Keep author queries brief or provide choices.

Where do we draw the line between making an edit and needing to add a query? The author need not be queried about basic changes to grammar, punctuation, and hyphenation (e.g., subject-verb agreement problems, insertion of serial commas, spelling variations and errors, hyphenation corrections). Additionally, do not query matters of AMS style (e.g., changing text in theorems to italics or marking functions to be roman). These are straightforward matters and will form the bulk of your copyediting. But when the answer is less obvious, the author gets to make the decision. Subject-verb mismatches and unclear antecedents are common problems; occurrences of repetition are much trickier and require author input or rewrites. Phrasing the query as a choice among suggested edits is often the best way to get a response—or a correction. Forming author queries requires good judgement from the copy editor. See section 2.66 of CMS for a deeper discussion of queries.

Since the AMS prefers that edits appear in the right margin, it is logical to place any AMS or author queries in the left margin. Please start each query with an identifier, "Author:" or "AMS:", so that each query is distinct. Author queries will appear in the set of proofs that are sent for the author's review.

1.4. Advice we still like

> *Wisdom consists of knowing when to avoid perfection.*
> —source unknown

In 1971 Ellen Swanson wrote her original edition of *Mathematics into Type*. Even with all the changes in publishing—especially LaTeX and online products—her advice below still rings true.

The general rule that covers all decisions is as follows: If it doesn't hinder readability and/or it doesn't look noticeably awkward, just leave as is.

- Sometimes the subject of a sentence is a full math expression containing a math verb. *Example*: As an algebra, $A = R\star H$ is the smash product $R\#H$, and as a coalgebra it is the smash coproduct, that is,
$$\triangle_A(r \star h) = \sum (r^1 \star (r^2)_{-1}h_1) \otimes ((r^2)_0 \star h_2).$$
- Sometimes the verb of a sentence is nestled in a math expression. If not read correctly, in some cases the sentence will appear to be lacking a verb, but it isn't. *Example*: Then $\mathrm{dec}(F_{(\preceq_n)}) \geq \mathrm{dec}(f)$ for any lsc $f : 2^w \to [0, 1]$.
- Long sentences are common and acceptable in math. Long sentences often contain conditions set off by commas. If read incorrectly, these sentences don't seem to make sense, but they do. *Example*: The conclusion will follow easily if we can show that if $\sigma_0, \ldots, \sigma_k \in 2^n$, $\sigma_0 \preceq_n \cdots \preceq_n \sigma_k$, and $l \leq k$, then there are $\tau_0, \ldots, \tau_{k+1} \in 2^m$ for some $m > n$ with $\tau_j|n = \sigma_j$ for $j \leq i$, $\tau_0 \preceq_m \cdots \preceq_m \tau_{k+1}$, and $\tau_i \neq \tau_{i+1}$.
- Don't change *since* to *because*.
- Keep the author's use of *which* and *that*.
- Don't add commas to a string of adjectives that doesn't already include commas, but don't delete the commas if the author has used them. *Example*: nonnegative nonincreasing continuous functions.
- Some authors like commas, and some don't. Even in nonmathematical writing, it is becoming more acceptable to not use commas after such things as introductory adverbial phrases that begin a sentence. If the author chooses not to use optional commas, leave the manuscript as is; however, whenever the absence of a comma causes confusion, please add it. Some authors overdo it with commas, but you should eliminate only the ones that are clearly in error. We follow the *Words into Type* guidance on "open" punctuation:

  > **Open and close punctuation.** The terms *open punctuation* and *close*[1] *punctuation* are often used with reference to commas and mean, respectively, using only as much punctuation as is absolutely necessary for clearness, and using

[1] Here "close" is pronounced *klose*, meaning tight.

as many marks as the grammatical construction will justify. Close punctuation often results in jerkiness without making the meaning clearer.

1.5. Miscellaneous hints

- Be careful about subject-verb "mismatches"; sometimes the real subject of a verb is not apparent. *Example*: The set of values that lie along the x-axis...; in this case, we don't know whether "lie" belongs to "set" or to "values", so just stet.
- Questions of various kinds can often be resolved by consulting the originally accepted manuscript because problems may have been inadvertently introduced at the AMS.
- Know the difference between a clause and a phrase; a clause contains a subject and a verb, whereas a phrase does not contain a finite verb. (See *Words into Type*, Glossary of Grammatical Terms, page 391.)
- Be aware that spacing between words is created automatically by LaTeX, accommodating different factors, and it can be difficult to change manually. For example, there may be a larger-than-usual space between a section heading and the first words of text if those words can't be broken. There is no need to change this space.

1.6. Resources

Important resources that help you discover the unknown and match AMS style include the following:

- *The Chicago Manual of Style, 16th Edition*, the standard source on grammar and style for scholarly work and for things not covered in this manual;
- *Mathematics into Type*, still the standard guide for typesetting mathematics, contains a lot of rules about editing math—especially how to break and align equations;
- *The Elements of Style* (commonly known as "Strunk and White"), a tiny but comprehensive guide to matters of grammar and style;
- *Words into Type*, an older guide to matters of style and grammar, remains relevant in shaping editorial style;
- *The Merriam–Webster Dictionary*, a *descriptive* dictionary, meaning it describes current usage and word treatment;
- *The American Heritage Dictionary*, a *prescriptive* dictionary, meaning it dictates current accepted usage and word treatment;

- *MathSciNet*, the database of Mathematical Reviews, can be used for clarifying or completing reference information, and it is also a good way to verify the existence and spelling of technical terms (`www.ams.org/mathscinet`);
- *The LaTeX companion*, this LaTeX guide has many useful tables for the copy editor in search of an unfamiliar symbol;
- a listing of mathematical publishers, with links to them (`http://www.ams.org/msnhtml/serials.pdf`);
- university and institution web sites.

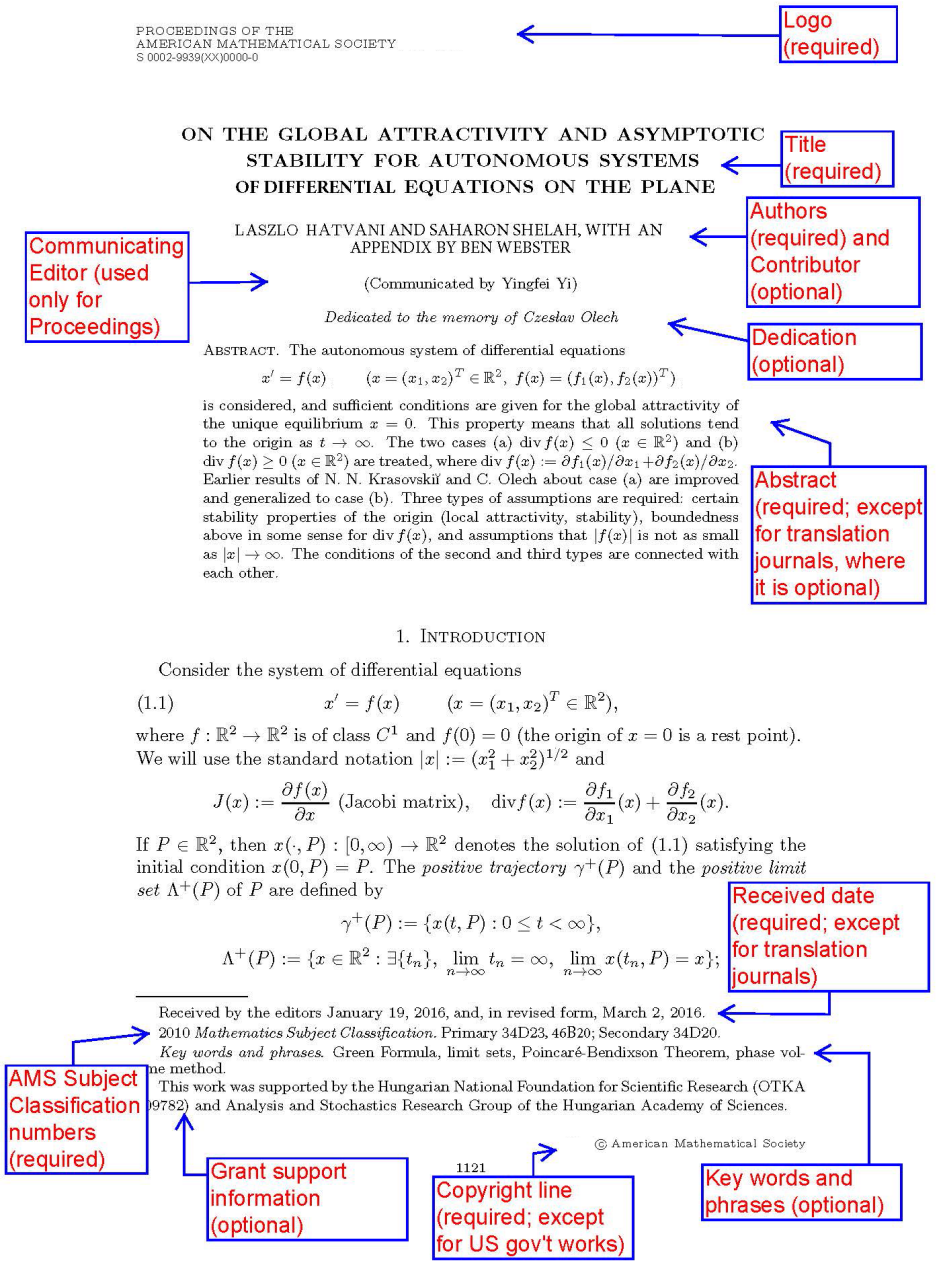


FIGURE 2. An example of a journal page with top matter elements called out

Chapter 2

Top Matter, Running Heads, and End Matter

2.1. Top matter

Top matter elements appear on the first page of an article. Top matter associated with an AMS journal article includes information that would appear in a bibliographic reference to the paper, plus dedications, the communicating editor, and the abstract. Top matter also includes first-page unnumbered footnotes: received and revised dates, mathematics subject classification numbers, key words, and acknowledgments of financial support. Some elements are required, while others are optional (each element is described in detail below).

2.1.1. Logo—*required element.*

- The logo appears in a top corner and contains the journal name and identifying information for the paper.
- The copy editor should check that the journal name is correct and mark it for correction if different.

2.1.2. Title—*required element.*

- Only the first word, the first word after a colon, and proper nouns should be capitalized. The copy editor should note that AMS formatting will produce the title in all caps, but this element should be

marked for proper capitalization since the title is reproduced in upper and lower case in the contents and in lists for indexing.

- Strong preference is to break before any prepositions, articles, or conjunctions, or logically within or around phrases. Avoid only one word on the last line.

✓:

HYBRIDIZABLE DISCONTINUOUS GALERKIN AND MIXED FINITE ELEMENT METHODS FOR ELLIPTIC PROBLEMS ON SURFACES

✘:

HYBRIDIZABLE DISCONTINUOUS GALERKIN AND MIXED FINITE ELEMENT METHODS FOR ELLIPTIC PROBLEMS ON SURFACES

- Ensure that spelling, hyphenation, en and em dashes, math, and symbols are consistent with the body of the paper. Ensure that math variables that are lowercase in the text are lowercase in the title.
- Leave acronyms in the title as submitted by the author.
- Footnotes are not allowed in the title.

2.1.3. Authors—*required element.*

- The author line is centered and follows the title.
- Leave order of author names as submitted. Do not use "et al." within the author line—all author names must appear here.
- Insert a space between initials.

V. A. SOHINGER, not V.A. SOHINGER

- There is a period after each initial in an abbreviated hyphenated name: Y.-N. Lee or J.-P. Serre.
- There is a comma before "and" with three authors or more.

AUTHOR ONE AND AUTHOR TWO

AUTHOR ONE, AUTHOR TWO, AND AUTHOR THREE

- Footnotes are not allowed in the author line.

2.1.4. Contributors—*optional element.*

Contributors are much like authors, but are responsible for only a portion of an article (e.g., an appendix, auxiliary tables). Contributors will be listed with the author(s) on the first page but will not be included in running heads; for example,

V. A. SOHINGER AND DAN ARCHDEACON,
WITH AN APPENDIX BY WILLIAM ROGERS

Affiliations provided for contributors will be treated the same as for regular authors.

2.1.5. Communicating editor—*required element for Proceedings.*

- This is a required element for *Proceedings of the AMS* only and appears below the author line in parentheses. The copy editor should mark this element to be added if missing.
- AMS style:

(Communicated by Matthew A. Papanikolas)

2.1.6. Dedication—*optional element.*

- A dedication is typically set below the author line (it follows the communicating editor line in *Proceedings*). Text is italic and centered; no period follows.
- The author's wording is usually appropriate.
- Wording for dedications in special issues may have been decided upon by the managing editor, such as in the following example:

This paper is dedicated to John Smith on the occasion of his 60*th birthday*

Often special issues forgo dedication lines in individual papers because the issue is dedicated to an individual and a separate dedication has been written for the issue.

2.1.7. Abstract—*required element.*

Keep in mind when editing that an abstract **must be able to stand alone**, independent of the paper; abstracts appear individually in databases for indexing services. Abstracts cannot contain references to bibliography citations or any of the paper's numbered elements, such as theorems and equations. There can be unnumbered math displays, multiple paragraphs, and numbered or bulleted lists.

- The text and mathematics of the abstract are treated exactly as in the body of the paper. Ensure that spelling, hyphenation, and other points of style are consistent with the paper.
- The use of first-person pronouns in the abstract is acceptable. Do not reword abstracts to remove the first-person, active voice.
- Cross-references to numbered equations that appear in the body of the paper should be reworded or replaced with the full equations. Confirm the change with the author.
- Abstracts cannot have numbered displays. Remove any numbers and edit any mention of the number in the text as needed.
- The abstract needs to be edited to *remove* or *rewrite* reference citations. Rewrite reference citations by placing the following information within brackets at the callout point. For journal article references, insert (in all lightface roman text) the journal abbreviation, volume, year, and page numbers, but not the article title. For book references, insert the title, publisher, location of publisher, and year. Only *book titles* appear in italics.

Abstract. Matsusaka and Osanai [Proc. Amer. Math. Soc. 145 (2017), pp. 1383–1392] give arithmetic formulas for the coefficients of Hauptmoduln of higher levels as analogues of Kaneko's formula for the j-invariant.

Abstract. We study the velocity of travelling waves of a reaction-diffusion system and show that it grows like the square root of the diffusivity on the line. This generalizes a result of Berestycki, Roquejoffre, and Rossi [*The influence of a line with fast diffusion on Fisher-KPP propagation,* Princeton University Press, Princeton, NJ, 2014].

Abstract. The main challenge of obtaining the differentiability of the semiflow is to determine the right type of differentiability and the right phase space (see V. Andreasen [*Semiflows generated by Lipschitz perturbations of non-densely defined operators*, Springer-Verlag, Berlin, 1989, pp. 142–151]).

- The copy editor should move footnotes out of the abstract and into the body of the paper if relevant text is repeated. If not repeated, include the footnote text within parentheses at the callout. Confirm the change with the author.
- Acronyms are to be spelled out on first use. If the acronym does not appear again in the abstract, spell it out and delete the acronym itself. Acronyms defined in the abstract must be defined again on first occurrence in the body of the paper.

- The length of the abstract depends primarily on the length of the paper itself and on the difficulty of summarizing the material. An upper limit of about 150 words for short papers and 300 words for long papers is suggested but generally the AMS does not require a limit.
- *Exception*: The abstracts in the *Journal of the AMS* appear only in the HTML homepages for each article, not in either the online pdf or print versions. Nevertheless, each abstract must be copyedited and is located at the end of the article just before the affiliations.

2.1.8. Article contents—*optional element*. Article contents are useful in long articles. The AMS limits the items included to numbered section heads, not numbered subsections. Article contents are located between the abstract and the start of the text.

2.1.9. Received and revised dates—*required element*.

- This appears as the first unnumbered footnote at the bottom of the first page (for translation journals, the received date appears on the last page following the affiliation(s)—for example, Received 22/MAR/2016).
- Each paper has an original received date and may have one or more revised dates. All received and revised dates are included, but not the accepted date.
- AMS style:

> Received by the editors [or "editor" for Math. of Comp.] May 23, 2014, and, in revised form, April 25, 2015, October 15, 2015, and January 12, 2016.

Note the use of commas and not semicolons between dates.

2.1.10. Mathematics Subject Classification—*required element*.

- This element appears as the second unnumbered footnote and follows the received date(s).
- The year should reflect the current version of the Mathematics Subject Classification (MSC) (which is 2010 at this writing).
- At least one primary subject classification number is required. The author may designate several numbers as primary, with each separated by a comma. The word "Primary" precedes the numbers.
- Secondary numbers may also be included and are optional. There may be several secondary numbers, each separated by a comma. The word "Secondary" precedes these numbers and is separated from the primary list by a semicolon.

- AMS style:

2010 *Mathematics Subject Classification.* Primary 68Q25.

2010 *Mathematics Subject Classification.* Primary 68Q25, 68R10; Secondary 68U05, 68-03, 11Gxx.

- Descriptions of the classification numbers should not be included.

2.1.11. Key words and phrases—*optional element.*

- This element appears as the third unnumbered footnote and follows the Mathematics Subject Classification line.
- The first word of the list and any proper nouns are capitalized. All other items are lowercase and are separated by commas. The list ends with a period.
- Any number of words or phrases may be included.
- Spelling, hyphenation, and other points of style should be consistent with the paper.
- AMS style:

Key words and phrases. Resolvent estimates, p-adic, Schrödinger equation, unique continuation.

2.1.12. Grant support information—*optional element.*

- The grant support acknowledgment appears as the last unnumbered footnote.
- This element contains information about grants or contracts under which the research was performed and may apply to one or all authors.
- Since footnotes to author names are not permitted, use "The second author" or "The first-named author" (not the author's name).
- The past tense should be used.
- Each author may have a support acknowledgment which may appear as separate footnotes or be combined into one footnote.
- Use of "Number", "No.", "number", "Grant", "grant", "Award", "award", "Project", "project" and similar labels that apply to the grant/award are acceptable as submitted.
- Acronyms (such as NSF, ERC, EPSRC) are acceptable and do not need to be spelled out.

- AMS style:

> This work was partially supported by the Natural Sciences and Engineering Research Council of Canada.
> The second author was partially supported by NSF grants CCR-9204868 and CCR-9504192.

or

> This work was partially supported by the Natural Sciences and Engineering Research Council of Canada. The second author was partially supported by NSF grants CCR-9204868 and CCR-9504192.

- Acknowledgment of thanks to colleagues, referees, or institutions should not appear here. If included, move to Acknowledgment section in the end matter.

2.1.13. Copyright information—*required element*.

- This element is set at the bottom right of the first page and is a placeholder at the copyediting stage. Final copyright information will be filled in when the paper nears completion in production.

2.2. Running heads

Running heads are derived from top matter elements.

- The right running head contains the title. Shorten the title for the running head if the full title is too long: it cannot exceed 4 inches (or 24 picas, which is approximately 50 characters including spaces and punctuation). If unsure of the correct way to shorten the title, query the author.
- The left running head contains the author name(s) and should appear as in the byline. If a shortened form is needed for the running head (which cannot exceed 24 picas or 4 inches), change to initials for the first and middle names. If still too long, use only the first author's name followed by "et al."; no comma precedes "et al.".
- All spelling and hyphenation in running heads should correspond exactly to the title and author names.
- Acronyms may be used in running heads, but do not use abbreviated words.

2.3. End matter

End matter appears at the end of an article and may consist of an acknowledgment section, information about the author(s), the reference section, author affiliations, and author email and URL addresses. As with the top matter, some of these elements are optional and some are required.

Acknowledgments

The author thanks T. de Fernex, C. De Lellis, J. M. Johnson, F. Mangolte, W. Kucharz, and K. Kurdyka for helpful comments, corrections, and references.

About the author

János Kollár is professor of mathematics at Princeton University specializing in algebraic geometry. He is a member of the National Academy of Sciences, and he received the Cole Prize from the American Mathematical Society.

References

[AK92a] S. Akbulut and H. King, *On approximating submanifolds by algebraic sets and a solution to the Nash conjecture*, Invent. Math. **107** (1992), no. 1, 87–98, DOI 10.1007/BF01231882. MR1135465

[AK92b] S. Akbulut and H. King, *Topology of real algebraic sets*, Mathematical Sciences Research Institute Publications, vol. 25, Springer-Verlag, New York, 1992. MR1225577

[Bat99] V. V. Batyrev, *Non-Archimedean integrals and stringy Euler numbers of log-terminal pairs*, J. Eur. Math. Soc. (JEMS) **1** (1999), no. 1, 5–33, DOI 10.1007/PL00011158. MR1677693

[BCR98] J. Bochnak, M. Coste, and M.-F. Roy, *Real algebraic geometry*, Ergebnisse der Mathematik und ihrer Grenzgebiete (3) [Results in Mathematics and Related Areas (3)], vol. 36, Springer-Verlag, Berlin, 1998. Translated from the 1987 French original; Revised by the authors. MR1659509

[BD84] R. Benedetti and M. Dedò, *Counterexamples to representing homology classes by real algebraic subvarieties up to homeomorphism*, Compositio Math. **53** (1984), no. 2, 143–151. MR766294

[Bea96] A. Beauville, *Complex algebraic surfaces*, London Mathematical Society Lecture Note Series, vol. 68, Cambridge University Press, Cambridge, 1983. Translated from the French by R. Barlow, N. I. Shepherd-Barron and M. Reid. MR732439

[CLO92] D. Cox, J. Little, and D. O'Shea, *Ideals, varieties, and algorithms, An introduction to computational algebraic geometry and commutative algebra*, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1992. MR1189133

[Com14] Annibale Comessatti, *Sulla connessione delle superficie razionali reali*, Ann. Mat. Pura Appl. **23** (1914), 215–283.

[dlVP08] Ch. de la Vallé Poussin, *Sur l'approximation des fonctions d'une variable réele et de leurs dérivées par des polynômes et des suites finies de Fourier*, Bull. Acad. Sci. Belgique (1908), 193–254.

[dF16] Tommaso de Fernex, *The space of arcs of an algebraic variety*, ArXiv e-prints (2016).

Department of Mathematics, Princeton University, Princeton, New Jersey 08544-1000

Email address: kollar@math.princeton.edu

URL: http://www-personal.princeton.edu/~jkollar

This is optional

This is optional

This section is required

Affiliation (required)

Both email and URL are optional

Figure 3. An example of a journal page with end matter elements called out

2.3.1. Acknowledgment—*optional element*.

Acknowledgments appear at the end of the text before the References as an unnumbered section.[1] They include statements of appreciation for helpful comments or supervision, thanks for programming or typing, or other similar information. Move any grant support information to the appropriate first-page footnote.

- The word is spelled *Acknowledgment*; check it in every paper.
- The head is *Acknowledgment* if only one acknowledgment is made and *Acknowledgments* if more than one acknowledgment is made.
- If the author has numbered the section, the number should be deleted.
- The use of first person plural in Acknowledgments is fine; don't change it to third person. However, make the voice parallel.

✓ We thank A. Terhorst for interesting insight. We also thank M. Harpe for clarifying some imprecise arguments.

✓ The authors acknowledge J. Townsend and S. Lichtman for their assistance at The Courant Institute. The authors also thank Dawn Kujawa for pointing out an error in the proof of Lemma 1.

✘ The authors acknowledge the help of Dennis Staudinger and Alex Hands. We also thank T. Setser for valuable comments.

- Generally, the author's wording should be preserved.
- The use of titles, such as Dr. Iris Murdoch, is acceptable. But other titles should not be abbreviated: Professor Ferry.

2.3.2. About the author—*required element for Bulletin*.

- This is a required element for the *Bulletin of the AMS*, which is the only place it will appear. It appears between the Acknowledgment section (if included) and the References as an unnumbered section.
- This is a 2–5 sentence blurb about the author(s) of a Research Expository article in the *Bulletin*. The first sentence should give the author's name and position and research institution. In referencing the author's position and institution, we follow the formality of the CMS, sections 8.27 and 8.67. The typical form is two sentences.

[1] In the *Bulletin of the AMS* there is an additional section, About the author, that falls between the Acknowledgments (if included) and the References.

About the author

Misha Gromov is a Permanent Member of IHES and is professor of mathematics at the Courant Institute of New York University. His many awards include the Wolf Prize, the Kyoto Prize, and the Abel Prize.

- Multiple authors each get this style of blurb, and they should appear in the same order as they are listed in their byline. Use the plural form of "author" if more than one author.

About the authors

Philippe Laurençot is senior researcher at the Centre National de la Recherche Scientifique and is affiliated with the Institut de Mathématiques de Toulouse, France.

Christoph Walker is professor at the Institut für Angewandte Mathematik of the Gottfried Wilhelm Leibniz Universität Hannover, Germany.

- Upon occasion an author will want to have more information listed.

About the author

Yuval Peres is a principal researcher at Microsoft Research in Redmond, Washington. He obtained his PhD at Hebrew University, Jersualem, in 1990 and later served on their faculty as well as the faculty at University of California, Berkeley. He has written more than 250 research papers in probability, ergodic theory, analysis, and theoretical computer science. Peres was awarded the Rollo Davidson Prize in 1995, the Loève Prize in 2001, the David P. Robbins Prize in 2011, and was an Invited Speaker at the 2002 ICM. He is a fellow of the American Mathematical Society and a foreign associate member of the U.S. National Academy of Sciences.

2.3.3. Note added in proof—*optional element*.

- A "Note added in proof" mentions results or sources that have come to the attention of the author(s) after acceptance of the paper and before electronic publication. It is usually submitted when the author returns proofs, so it will not be available to the copy editor.
- The note is the last item before the references.
- Treat the head as an unnumbered section head.

Note added in proof

The text is paragraphed and should be edited to conform to the style used elsewhere in the paper.

- A note may include new reference citations. These should be set up like the other text citations (see References below) and the references should be included in the original reference list.
- If a "Note added in proof" appears in a manuscript, stet.
- Some notes may contain new mathematical content; in this situation the content should be reviewed by the journal editor.

2.3.4. References—*required element.*

Please see Chapter 10 for handling references.

2.3.5. Affiliation—*required element.*

- Author affiliations are set after the reference section and are listed in the same order as in the author line in the top matter.
- An affiliation is required for every author, and each affiliation appears separately even if two or more authors have the same affiliation.
- Affiliations for U.S. authors should include the author's department, institution, city, state (no abbreviations, i.e., Minnesota, not MN), and zip code. Acronyms such as INRIA are acceptable; there's no need to spell them out.
- If an author has no institutional affiliation, it is acceptable to include his or her street address.
- For authors outside the U.S., include all information given, making sure that it includes the author's institution and country. Spell out Canadian provinces and territories, such as British Columbia for BC. Stet the author's use of United Kingdom, Great Britain, or England. Spell out People's Republic of China or add it if missing. (Note that the Republic of China (ROC) is not the same as the People's Republic of China.) Stet the author's placement of the postal code—before or after the city—as long as the country is last.
- The AMS prefers "Department of Mathematics" over "Mathematics Department".
- AMS style:

Department of Mathematics, The University of Texas at Austin, Austin, Texas 78712

Department of Mathematics, University of British Columbia, Vancouver, British Columbia V6T 1Z2, Canada

Institut für Statistik, Ökonometrie und Operations Research, Universitätsstrasse 15, Universität Graz, A-8010 Graz, Austria

Institute of Applied Mathematics, Chinese Academy of Sciences, Beijing 100080, People's Republic of China

- If an author includes an update to his or her address, leave the affiliation and the address that the author originally provided and follow it with "Current address:".
- AMS style:

Institute of Applied Mathematics, Chinese Academy of Sciences, Beijing 100080, People's Republic of China
Current address: Department of Computer Science, University of Vermont, Burlington, Vermont 05405

2.3.6. Email addresses and author URLs—*optional elements*.

- Email addresses are optional and appear on a separate line following the affiliation.
- If an author's URL is provided, it appears on a separate line following the email address.
- AMS style:

Central Economics and Mathematical Institute, Moscow, Russia
Email address: kanchelskis@cemi.msk.su
URL: http://www.intertrust.com/star/goldberg

2.3.7. Translator—*optional element for translation journals*.

- Appears on the last page after the references or affiliations, depending on the journal style.
- AMS style:

Translated by S. KISLYAKOV

Translated by YOSHIHIRO MIZUTA

Chapter 3

Section and Subsection Heads

3.1. Heading styles

Section and subsection heads are optional but they almost always appear. LaTeX formats them according to AMS style for heading levels. The copy editor must know the style requirements of the various levels of heads since any deviation may indicate improper coding. Math is always permissible in section heads, but displays are not. Any math in any head appears in math mode; it is *not* fonted to match the section head.

- The AMS uses sentence-style capitalization for all headings: the first letter is capped and the rest are lowercase, unless they are proper nouns. The exceptions to this are either when the heading contains more than one sentence or when a colon appears within the heading. The first letter after either a period or a colon is also capped.
- Section heads are set in caps/small caps font.

3. Results: The discrete Heisenberg group

- Because section heads stand apart from the text, there is *no* period at the end.
- The text following a section head has a paragraph indent unless it is an enunciation.
- A subsection head appears flush left and is part of a paragraph, *unless* it precedes another heading or enumerated element. It begins with its

number (if any) in roman type followed by a period. The subsection title is in bold type and is set in sentence style, with no other letters capitalized unless they are proper nouns or mathematical items (e.g., Theorem 2.1).

2.1. **Basic equations and Fredholm's equations.**

Theorem 2.1. [*The text continues in paragraph form and italics since this example is a theorem.*]

- A subsection head is *always* followed by a period. The text runs in (unless what follows is another lower-level head, theorem, remark, or other item that requires a new paragraph). If the heading does not match these specs, it is a clue to the copy editor that the spacing is not being done automatically by LaTeX. This should be noted for the compositor to correct throughout the paper.
- If a reference is cited within the section head, it appears at the end of the subsection head in bold parens and *before* the period in roman text. Because the reference is a linked citation, it will always appear in lightface.

1.1. **Applications ([1]).**

6.5. **Stress intensity factors of Theorem 3.7 ([27]).** [The text continues in paragraph form.]

- Section and subsection heads may also contain parenthetical information, which should follow sentence-style caps.

3.1. **Summary of results (on foliations).** [The text continues in paragraph form.]

- There is a known inconsistency of style that appears between subsection heads and numbered enunciations (see p. 34). A subsection head will be all bold, including parens around a citation, which appears in lightface roman. When a reference appears within a numbered enunciation, the citation—including its parentheses—outputs as all lightface roman. The AMS does not correct for this inconsistency.
- A third level of section head, a subsubsection head, is perfectly allowable. The subsubsection head has a roman style arabic number and the title is in italics followed by a period. The text is run in after this head.

3.1.1. *Basic properties of outer L_p.* [The text continues in paragraph form.]

- Underscoring is not permitted in any form of section head.
- It is possible for there to be two additional levels of section heads (paragraph and subparagraph), but these are very unusual and are more likely to appear in a book than in a journal article.

3.2. Numbering

Check the manuscript for gaps and duplications in numbering. The AMS allows authors considerable leeway in their numbering systems as long as the system is consistent and the cross-references are correct. The style and consistency of any numbering system will become evident as you fill in the numbering system section of the style sheet.

The AMS uses roman style arabic numerals to number sections 1, 2, 3, etc. Subsections are numbered within their sections, 3.1, 3.2, etc.; and subsubsections are numbered within their sections and subsections, 3.1.1, 3.1.2, etc.

AMS style for section numbering:

1. The Boolean hypercube

In this section, the Boolean hypercube....

AMS style for subsection numbering:

1.1. **Applications.** There are a number of useful applications....

AMS style for subsubsection numbering:

1.1.1. *Chord diagrams, seeds, and shapes.* Recall that the so-called Catalan numbers....

3.2.1. Variations. The following are common variations on this form and the appropriate changes to make, if any.

- **There are parts or other supersections.** A very long manuscript may be divided into parts identified with roman numerals, with numbered sections within them. Allow this arrangement to stand.

- **Roman numerals or letters are used.** If a paper has numbered parts, the AMS prefers a capital roman numeral. If sections have roman numerals, change them to the corresponding arabic numeral.
- **The introduction is unnumbered or is numbered 0.** Delete the 0 from the head, but otherwise make no changes. Do not renumber other sections or equations in order to renumber the introduction as 1. Allow equation numbers (0.1) and other numbering to stand.
- **The Acknowledgments section is numbered.** Delete the number.
- **The Note added in proof section is numbered.** Delete the number.
- **The About the author section is numbered.** Delete the number.
- **The References section is numbered.** Delete the number.

3.2.2. Unnumbered section and subsection heads. Authors may use unnumbered section and subsection heads. The copy editor must check that each occurrence matches the spacing and font style of its numbered equivalent. If not, add a note for the compositor to code for the correct unnumbered section or subsection head as appropriate. Mark the text that follows a section head with a paragraph indent.

3.3. Text callouts

- Two or more sections are cited in text as "see sections 2.3 and 4.2" or "see sections 2.3, 4.2, and 4.3", not as "see section 2.3 and section 2.4" or "see section 2.3, section 4.2, and section 4.3", respectively.
- Every section callout must include the word "section". If the author cites numbers without identification, determine whether a section or subsection is being cited and insert the identifier. When in doubt, query the author.
- If text callouts must be changed, leave a note describing the problem, and the compositor will manage it.
- AMS style is to spell out "section", but we will allow "§" if used consistently.

Chapter 4

Enunciations

4.1. Enunciations

Here we get into the "meat and potatoes" of mathematical text—the enunciations. There are four general enunciation categories—theorems, proofs, definitions, and remarks—which form the basis for all of our enunciation styles. Most often, these are numbered, in which case we refer to them as *enumerated elements*. If an author has very few of these, they sometimes decline to number them. This is perfectly acceptable, but check to be sure there aren't, for example, two unnumbered theorems within a single work.

If any enunciation is displayed in a style that varies from what is described below, write the correct category of style in the right margin: e.g., an italic "Theorem 3.1" with roman text should be marked for "standard theorem style" in the right margin. The compositors will make the change.

4.1.1. Theorem style.

- Theorem style includes the following enunciations:

Theorem heading: title and number **bold**. Theorem text: *italic*

Algorithm[a]	Corollary	Proposition
Assertion	Criterion	Reduction
Axiom	Hypothesis	Sublemma
Conjecture	Lemma	Theorem

[a] Algorithms are often coded similarly to theorems, but those that are displays of computing algorithms take a different style; see the examples in the final subsection in this chapter (p. 35).

- Theorem-style enunciations are set flush left with a 10pt bold name and number, the text is italic, and there is white space above and below. AMS style:

Theorem 3.1. *Let (M, ω) be a symplectic $2n$-dimensional manifold. Near each point $x_0 \in M$ there are coordinates $(x_1, y_1, \dots, x_n, y_n)$ in which $\omega = \sum_{i=1}^{n} \mathrm{d}x_i \wedge \mathrm{d}y_i$.*

- Spell out numbered theorem-style enunciations in full (e.g., Theorem 2.1) since they are proper nouns. Abbreviated forms (e.g., Thm. 2.1) are not allowed except when cited as part of a reference (e.g., [11, Thm. 2.1]).

4.1.2. Proof style.

- Proof style includes the following enunciations:

Heading: title *italic* and number roman (if any). Text: roman

Proof | Subproof

- Proof-style eunuciations are set flush left with a 10pt italic name, usually unnumbered (but roman numbers if required), the text is roman, and there is white space above and below. Proofs commonly end with an open square box (a QED box), which is flush right at the end of the last line of the proof. The QED box may land flush right on a separate line if it follows a full line of text, a display, or a list. *Mark for the box to be moved up a line only when it follows a list and there is room at the end of the last line.* AMS style:

Correct:
Proof. Claim 3.3 is again a local question, so we may assume that M is the common zero set of $r = N - n$ real polynomials. □

Correct:
Proof. $L(p)$ can be generated by $v_1(p), \dots, v_k(p)$. Since each $v_j(p)$ depends continuously on p, choosing a small neighborhood $\mathcal{V}$ of p the vectors $v_1(p'), \dots, v_k(p')$ are independent also for $p' \in \mathcal{V}$, hence $\dim_{\mathbb{R}} L(p') \geq 0$. □

Correct:
Proof. Then a straightforward computation shows that

$$\eta^{(m)}(\alpha) = \frac{n^{\alpha-l+1}}{l!} \sum_{k=0}^{\min(l-1,m)} \binom{m}{k} w_l^{(k)}(\alpha)(\log n)^{m-k}.$$

□

Incorrect:
Proof.
(1) Initialization: set the initial approximation $\mathbf{c}^0$ as an s-sparse lower vector, e.g., $\mathbf{c}^0 = \mathbf{0}$.
(2) Iteration: repeat until a stopping criterion is met at $n = \overline{n}$.
□

4.1.3. Definition style.

- Definition style includes the following enunciations:

Heading: title and number **bold**. Text: roman

Affirmation	Discussion	Property
Application	Example	Question
Assumption	Exercise	Scholium
Condition	Fact	Terminology
Convention	Model	
Definition	Problem	

- Definition-style enunciations are set flush left with a 10pt bold name and number, the text is roman, and there is white space above and below. AMS style:

Definition 3.2. A *real algebraic set* is the common zero set of a collection of polynomials $X := \{\mathbf{x} : f_1(\mathbf{x}) = \cdots = f_r(\mathbf{x}) = 0\} \subset \mathbb{R}^N$.

- Spell out numbered definition-style enunciations in full (e.g., Definition 2.1) since they are proper nouns. Abbreviated forms (e.g., Def. 2.1) are not allowed except when cited as part of a reference (e.g., [11, Def. 2.1]).

4.1.4. Remark style.

- Remark style includes the following enunciations:

Heading: title *italic* and number roman. Text: roman

Answer	Conclusion	Subcase
Base	Note	Step
Case	Notation	Summary
Claim	Observation	
Comment	Remark	

- Remark-style enunciations are set flush left with a 10pt italic name and roman number, the text is roman, and there is white space above and below. AMS style:

Remark 3.3. Besides the infinitely many cases of two-bridge knots listed in Theorem 1.2, explicit calculations seem to confirm Theorem 1.1.

- Spell out numbered remark-style enunciations in full (e.g., Remark 2.1) since they are proper nouns. Abbreviated forms (e.g., Rem. 2.1) are not allowed except when cited as part of a reference (e.g., [11, Rem. 2.1]).

4.1.5. Upwardly mobile style. Typically, only theorem-style enunciations carry proofs. If an enunciation that belongs to a different category carries a proof (e.g., a claim may carry a proof, which is acceptable), the enunciation may need to be changed to theorem style. In such an instance, please note this for further review.

4.1.6. Parenthetical text within subsections and numbered enunciations. There is a known inconsistency of style that appears between subsection heads and numbered enunciations, which are similar in appearance. A subsection head will be all bold, including parenthetical text. When a reference appears within a numbered enunciation, the citation—including its parentheses—outputs as all lightface roman.

2.1. **Carleson embeddings (Schuyler,** [7]**).** The variational ...

Lemma 2.2 (Hamilton and Burr, [7])**.** *Let* $\gamma : \mathbb{Z}^{\mathrm{d}} \to \mathbb{R}$...

The AMS copy editor should circle parenthetical text that does not conform to the example above (Lemma 2.2) within a numbered enunciation only, and write "XTRA" in the right margin. The compositor will understand that this a specific coding instruction for handling parenthetical information in a numbered enunciation. Stet bold parenthetical text in subsection heads (as shown in 2.1 in the example above).

4.1.7. Variants for algorithm style. If an algorithm appears in text and it is a mathematical item, it is coded as a theorem style enunciation. However, if it is part of computer code, it appears in a different format.

Example of theorem style:

Algorithm 1.1 (Iterative hard thresholding on lower sets)**.**
(1) *Initialization*: *set the initial approximation* $\mathbf{c}^0 = \mathbf{0}$.
(2) *Iteration*: *repeat until a stopping criterion is met at* $n = \overline{n}$*:*

$$\mathbf{c}^{n+1} = H_s^\ell(\mathbf{c}^n + \mathbf{A}^*(\tilde{\mathbf{g}} - \mathbf{A}\mathbf{c}^n)).$$

(3) *Output*: $\mathbf{c}^\# = \mathbf{c}^{\overline{n}}$, *and* $g^\# = \sum_{\nu\in\mathcal{H}_s} c_\nu^\# \Psi_\nu$.

Example of computer code:

Algorithm 1 `FlipLinkage`

Input: $k_1, k_2 \in \mathbb{K}$ such that $\mathrm{pp}(k_1) \neq \overline{\mathrm{pp}(k_2)}$ and $\mathrm{pp}(k_1), \mathrm{pp}(k_2) \in \mathbb{C} \setminus \mathbb{R}$.
Output: (G, ρ) a flip linkage.

1: **Define** $V = \{1, 2, 3, 4\}$ and $E = \{(1, 2), (2, 3), (3, 4), (1, 4)\}$ and set $G = (V, E)$.
2: **Define** $u_i = \chi k_i$ for all $i \in \{1, \ldots, 4\}$.
3: **Define**

$$\begin{array}{rclcrcl} \rho(1,3) & = & \big(\Re(u_1), \Im(u_1)\big) & \qquad & \rho(2,1) & = & \big(\Re(u_2), \Im(u_2)\big) \\ \rho(3,4) & = & \big(\Re(u_3), \Im(u_3)\big) & & \rho(4,2) & = & \big(\Re(u_4), \Im(u_4)\big) \end{array}$$

4: **Return** (G, ρ).

Please familiarize yourself with these styles. Many times an enunciation that does not match the style of the journal is an indication that the author has hard coded it, which can cause problems with linking later in the process. If you see any deviation from AMS style, please mark it in the right margin.

Chapter 5

Footnotes

LaTeX very reliably sets footnotes at the bottom of the page where the footnote marker appears.[1] Here is a list of characteristics for AMS style footnotes.

- A footnote is located at the bottom of the page on which its callout appears, separated from the body of the paper by a 5pc wide rule.
- A text footnote is set in 8pt CM type. It begins with a paragraph indent and a superscript arabic number, and it ends with a period.
- Text footnotes are numbered with consecutive superscript arabic numbers. If the author has used asterisks, daggers, etc., let it stand if all cross-references and coding are OK.
- A footnote callout is placed after the word or phrase to which it refers, or it is placed after internal and end punctuation. AMS style:

> We denote the vertical deflection,[2] of the elastic plate at position $(\hat{x}, \hat{y}) \in \widehat{D} \ldots$.
>
> The previously cited thesis,[3] elaborated upon by Vaughan and Young, presents an extended discussion of this idea.[4]

- If the author has cited a footnote within a mathematical expression, the callout could cause confusion with superscripts. If a footnote symbol can be mistaken for a mathematically pertinent superscript, alleviate

[1] Here is a handy example.

the ambiguity in one of the following ways:

(a) Move the callout to the end of the text preceding the displayed mathematics.

(b) Rewrite the sentence so that the footnote marker is presented in an unambiguous position. (This requires an author query.)

- Equations and other mathematical material in footnotes are allowed. Set these as compactly as possible; avoid displays or lists within a footnote when possible. The following examples show the same footnote set three ways.

✓ : [5]To see the equivalence, assume that $\mu[r(x) > l^k] < c/l$. Let $\varepsilon = \frac{1}{2k}$. Then, for all $l \in \mathbb{R}^+$, $\mu[r^\varepsilon(x) > l] < c/l^2$, and so

$$\sum_x r^\varepsilon \mu(x) \le \sum_{n=1}^{\infty} n\mu[n-1 < r^\varepsilon(x) \le n] = \sum_{n=0}^{\infty} \mu[r^\varepsilon(x) > n] < \infty.$$

The example above shows the maximum compaction of this footnote; cf. the ✘ example below.

ok : [5]To see the equivalence, assume that $\mu[r(x) > l^k] < c/l$. Let $\varepsilon = \frac{1}{2k}$. Then, for all $l \in \mathbb{R}^+$,

$$\mu[r^\varepsilon(x) > l] < c/l^2,$$

and so

$$\sum_x r^\varepsilon \mu(x) \le \sum_{n=1}^{\infty} n\mu[n-1 < r^\varepsilon(x) \le n] = \sum_{n=0}^{\infty} \mu[r^\varepsilon(x) > n] < \infty.$$

The example above shows how displays can be distracting within a footnote; cf. the ✓ example above.

✘ : [5]To see the equivalence, assume that $\mu[r(x) > l^k] < c/l$. Let $\varepsilon = \frac{1}{2k}$. Then, for all $l \in \mathbb{R}^+$, $\mu[r^\varepsilon(x) > l] < c/l^2$, and so $\sum_x r^\varepsilon \mu(x) \le \sum_{n=1}^{\infty} n\mu[n-1 < r^\varepsilon(x) \le n] = \sum_{n=0}^{\infty} \mu[r^\varepsilon(x) > n] < \infty$.

This last example is wrong because the second line contains an unacceptable linebreak within the in-text mathematics; see Chapter 13.

- If a footnote is actually a reference, move it to the References section and replace the footnote citation with a reference citation.
- Reference citations are allowed in footnotes.

Chapter 6

Lists

6.1. Numbering

Any consistent, unambiguous system of item identifiers is acceptable, including arabic numbers, uppercase or lowercase roman numerals (1, I, i), uppercase or lowercase letters (A, a), lowercase Greek letters (α, β), or a combination of bullets, en dashes, and asterisks (•, –, *).

- Paragraph-style lists are indented with the author's choice of identifier and they fit into standard text margins. These can also be multiparagraph items.
- When working within the enumerate environment, the copy editor should enclose the identifying numbers or letters in a complete set of parentheses.
  - The first-level list uses numbers as the *default* within the enumerate environment: (1), (2), (3), etc.
  - The second-level list (default) uses lowercase letters: (a), (b), (c), etc.
  - The third-level list (default) uses lowercase roman numerals: (i), (ii), (iii), etc.

  The AMS will accept variations as long as they are consistent. This style of list is being coded for linked cross-references with increasing frequency.
- When working within the itemize environment, the copy editor should use the default item identifiers—that is, bullet (•) at the first level and then the en dash (–) at the second level. This type of list does not typically have linked cross-references.

- Ambiguity can arise if the author included several lists with repeated numbering, which is *not* an unusual scenario. In this case add qualifying callouts, e.g., change "as in item (1)" to "as in item (1) in section 2.2". Query the author to notify him or her about the change.
- Item numbering within enunciations and their proofs should have the same item identifiers whenever they are referenced.

Lemma 3.7. *The following hold:*
(1) $(\Phi_t^* f_i)(x) - \sum_j a_{ij}^t(x) f_j(x), x \in X_U, t \in (o, 1], 1 \le i \le n \ldots$.
(2) *The limit as* $t \to 0$ *of* Φ_t *acting on the* $f_i, \ldots$.

Proof. For (1) we compute that. . . .

- Identifiers are lightface, never bold.

6.2. Type style and arrangement

The AMS allows authors great latitude in formatting lists. The corrections we insist upon include parallel construction of the list items, a unified approach to any single list (all enumerated items or all itemized items), and no internal sentences within lists that continue from a single sentence.

- **Ensure that items within a list are parallel.** All phrases or all complete sentences should have parallel construction. They should follow in a logical pattern from the sentence above it; see section 6.5.
- Stet lists set within a paragraph if the items are short. Break out longer items into a formatted list. In the following example the items are run in since each is short. They could have been separated into a vertical list, but since the author did it this way, we would stet it. (Note the colon, semicolons, and lowercase or math at the start of each item.)

It is convenient to split this into three regions: (1) Region A, $n, [n/2]$; (2) Region B, $[n/3]$; (3) Region C, $[n/(3 \cdot 2)], \ldots, [n/(3 \cdot 2^{lb-(i+2)})]$.

- In an enumerated environment the default format is to indent the identifier, then, after a quad of space, the text follows in a hanging indent format. The following is an example of a list breaking out a single sentence.

It is convenient to split it into three regions:
Region 1. $n, \lceil n/2 \rceil$.
Region 2. $\lceil n/3 \rceil$.
Region 3. $\lceil n/(3 \cdot 2) \rceil, \ldots, \lceil n/(3 \cdot 2^{lb-(i+2)}) \rceil, \ldots$.
In Region 1, b_{i+1} is either n or $\lceil n/2 \rceil$; that is, $i = lb - 1$ or $i = lb - 2$.

- The indentation for lists is slightly greater than for a paragraph indent and will not exactly match a paragraph indent.
- Do not mark to run a list item into the text above it. AMS style is to stet the following arrangement:

✓:

Theorem 1.
(a) *The approximant H in Theorem* 2 *is obtained by taking* $S = 0$.
(b) *If we take* $S = 0$, *then we obtain* $H = n$.

- If the first item of a hanging indent list (see sections 6.5.2–6.5.4) is run in after a heading, mark it to start a new line. When left as displayed below, linking does not work. (Note that this is not an issue for paragraph style lists; see section 6.5.1.)

✘:

Theorem 1. (a) *The approximant H in Theorem* 2 *is obtained by taking* $S = 0$.
(b) *If we take* $S = 0$, *then we obtain* $H = n$.

- If the author used "and" or "or" before the last entry in a series, stet it. Do not add "and" or "or", however.
- List items may complete an introductory sentence; see section 6.5.5.
- Subitems are indented from the main items; see sections 6.1 and 6.5.
- Equation numbers for displayed math in indented text fall at the left margin.

6.3. Punctuation and capitalization

- Every entry must be punctuated (see section 6.5).
- Only those entries that are complete sentences are capitalized; phrases are lowercase (see section 6.5.4).

6.4. Text callouts

- Identifying letters ((a), (b), (c)), including their parentheses, are roman in all text. The AMS will allow italic identifying letters only if consistent throughout.
- Listed items are usually cited with reference to the enunciations to which they belong: Theorem 3(b) refers to item (b) in a list within Theorem 3.

6.5. List examples

6.5.1. Numbered in paragraph style. These fall within standard text margins with paragraph indent and are numbered as the author chooses.

... Then the following hold:

(1) Our definition should be essentially the same as Levin's notion when we apply it to polynomial time-bounds.

(2) If L belongs to DTIME($T(n)$) for some time-bound T, then any distributional problem (L, μ) is T on the μ-average.

(3) If L is not in DTIME($T(n)$) almost everywhere, then for any distibutional problem (L, μ), L is not T on the μ-average.

6.5.2. Numbered with hanging indents. Enumerated text with hanging indents should be introduced by a complete sentence followed by a colon.

... Then the following hold:

(1) There exists a dense open subset $V(k) \subset |\mathscr{L}|^{d-1}$ such that for any $(D_1, \ldots, D_{d-1}) \in V(k)$, $C := D_1 \cap \cdots \cap D_{d-1}$ is an irreducible projective non-singular curve contained in U.

(2) Furthermore, let U' be as in (2). Take any $x \in U'(k)$. Then for any proper closed subset W of X, there exists a $(D_1, \ldots, D_{d-1}) \in V_x(k)$ such that $\mathrm{Supp}(D_1 \cap \cdots \cap D_{d-1}) \nsubseteq W$.

6.5.3. Bulleted with hanging indents. Itemized lists with hanging indents are introduced by a complete sentence followed by a colon.

In this text we examine the following:

- For each **P**-time function ensemble $f : \{0,1\}^{t_n} \to \{0,1\}^{l_n}$ that instantiates primitive 1, $g^{(f)} : \{0,1\}^{t'_n} \to \{0,1\}^{l'_n}$ instantiates primitive 2.
- $g^{(f)}$ is a **P**-time function ensemble, and on inputs of length t'_n, it only makes calls to f on inputs of length t_n.
- Let $\mathcal{D}_1 : \{0,1\}^n$ and $\mathcal{D}_2 : \{0,1\}^n$ be not necessarily independent probability ensembles; let $\mathcal{D} = \langle \mathcal{D}_1, \mathcal{D}_2 \rangle$. A probability ensemble $\mathcal{E} : \{0,1\}^{2nk_n}$, with $\mathcal{E} = \langle \mathcal{E}_1, \mathcal{E}_2 \rangle$, satisfies the following:
  - For every value $E_1 \in \{0,1\}^{nk_n}$ such that $\Pr_{\mathcal{E}_1}[E_1] > 0$, $\mathbf{H}_{\mathbf{Ren}}(\mathcal{E}_2 | \mathcal{E}_1 = E_1) \geq k_n \mathbf{H}(\mathcal{D}_2 | \mathcal{D}_1) - nk_n^{2/3}$.
  - $\mathbf{L_1}(\mathcal{E}, \mathcal{D}^{k_n}) \leq 2^{-k_n^{1/3}}$.

6.5.4. Lowercase roman numerals with hanging indents. These are enumerated lists that have been coded to begin with a roman numeral. The same rules as for section 6.5.2 apply.

Then we can describe G as follows:

(i) a description of this discussion in $O(1)$ bits;
(ii) the enumeration of all labels in at most $n^2/32$ (by assumption);
(iii) a description of the $n/2$ nodes in this enumeration in at most n bits;
(iv) the interconnection patterns of these $n/2$ nodes in $n/8 - 3\log n$ plus $n/2 + o(n)$ bits each (by assumption and using Claim 2.1); this amounts to $n/2(5n/8 - 3\log n) + o(n^2)$ bits in total with separations encoded in another $n \log n$ bits.

6.5.5. Items continuing from introductory sentence. (Please note that there is no colon at the end of the introductory sentences below. The majority of guidance recommends against this form. However, the AMS has noticed a growing trend in this particular usage, so the AMS will allow it if handled consistently.)

Putting together the results in this section, we have

- a reduction from a one-way permutation to a pseudorandom generator (from subsection 4.2);
- a reduction from a one-to-one one-way function to a pseudorandom generator (combining subsections 4.3 and 4.6);
- a reduction from a pseudorandom generator to a pseudorandom generator (from subsection 4.6).

The connected graph G is built by

(1) committing all uncommitted edges, as described above;
(2) joining the remaining open entry vertices with some number, Δ, of extra vertices so as to make G have n vertices and be d-regular; and
(3) designating one of these extra vertices as t.

- Let $\mathcal{D} : \{0,1\}^n$ be a probability ensemble. There is a probability ensemble $\mathcal{E} : \{0,1\}^{nk_n}$ satisfying
  - $\mathbf{H_{Ren}}(\mathcal{E}) \geq k_n \mathbf{H}(\mathcal{D}) - nk_n^{2/3}$,
  - $\mathbf{L_1}(\mathcal{E}, \mathcal{D}^{k_n}) \leq 2^{-k_n^{1/3}}$.

6.5.6. Complex items following an introductory sentence.

✘ :

... If (A1) and (A2) are satisfied where $\omega - \beta > 0$, then the following apply:

(i) For each $p' > 0$ and $T > 0$ the following inequalities are satisfied:

$$\sup_{\alpha\in\mathcal{A}}\sup_{u\in\mathcal{U}}\mathbb{E}^{\alpha}_{x,u}\left[\sup_{0\le t\le T}|X(t)|^{2p'}\right] \le C_T|x|^{2p'} + \tilde{C}_T \tag{1}$$

and

$$\sup_{t\in\mathbb{R}_+}\sup_{\alpha\in\mathcal{A}}\sup_{u\in\mathcal{U}}\mathbb{E}^{\alpha}_{x,u}[|X(t)|^{2p'}] \le C_1|x|^{2p'} + C_2 \tag{2}$$

(ii) For each $x \in H$, $\alpha \in \mathcal{A}$, and $u \in \mathcal{U}$ the following inequality is satisfied:

$$\limsup_{t\to\infty}\frac{1}{t}\int_0^t |X(s)|^2 ds < \infty \qquad \text{a.s.} \quad \mathbb{P}^{\alpha}_{x,u} \tag{3}$$

This is categorized as a bad example because the AMS style preference is to let the mathematics flow through the sentence rather than stop the sentence for the mathematics. Specifically, compare the sentences following items (i) and (ii) above and below.

✓ :

... If (A1) and (A2) are satisfied where $\omega - \beta > 0$, then the following apply:

(i) For each $p' > 0$ and $T > 0$ the inequalities

$$\sup_{\alpha\in\mathcal{A}}\sup_{u\in\mathcal{U}}\mathbb{E}^{\alpha}_{x,u}\left[\sup_{0\le t\le T}|X(t)|^{2p'}\right] \le C_T|x|^{2p'} + \tilde{C}_T \tag{4}$$

and

$$\sup_{t\in\mathbb{R}_+}\sup_{\alpha\in\mathcal{A}}\sup_{u\in\mathcal{U}}\mathbb{E}^{\alpha}_{x,u}[|X(t)|^{2p'}] \le C_1|x|^{2p'} + C_2 \tag{5}$$

are satisfied.

(ii) For each $x \in H$, $\alpha \in \mathcal{A}$, and $u \in \mathcal{U}$ the inequality

$$\limsup_{t\to\infty}\frac{1}{t}\int_0^t |X(s)|^2 ds < \infty \qquad \text{a.s.} \quad \mathbb{P}^{\alpha}_{x,u} \tag{6}$$

is satisfied.

Chapter 7

Figures

Much figure work will be done outside of the copyediting cycle; however, numbering, cross-references, and caption placement and punctuation all need to be reviewed for consistency. The AMS allows authors very wide latitude on wording their captions, and parallel construction is not strictly required (though it is *always* preferred).

Because the AMS production system has to handle graphics generated by many different software packages, the occasional misread occurs. For this reason, **the copy editor must carefully proofread the figures in the AMS copy against the author's original submission**. If there are differences, flag them for the AMS to resolve.

In AMS journals, it is standard practice for figures to appear in color online but black and white in print. At the time of this writing, *the online version is the journal of record*. For the copy editor, this means that text references to any colors appearing in a figure are acceptable.

All *numbered* figures must carry an in-text callout so that each figure will be linked to the text in the online version. If a numbered figure has no cross-reference, please either add it if its location is clear or query the author about where the cross-reference should go.

7.1. Numbering

Figure numbers follow the same rules as described in section 3.2, but AMS's strong preference is that figures should be numbered independently of other numbered enunciations, including tables. Please note that the AMS does not use hyphens in section-numbered figures (e.g., Figure 7-1 is not acceptable).

Figures may either be numbered consecutively throughout the paper or be numbered within sections, regardless of whether other numbered enunciations have section numbers. If there are just a few figures, it is perfectly acceptable to allow figure numbering to run consecutively through the paper without reference to the section numbers.

Figure numbering may require adjustment for several reasons.

- Any gaps or duplications in numbering must be edited to be in sequence, and any missing or incorrect in-text callouts must be added or corrected, respectively.
- Complex mathematical displays are common in AMS journals and should not be relabeled as figures. The exception to this rule is when a figure must be set in a landscape orientation; see Figures 7 and 8.
- The author may have numbered a table as a figure. Relabel and renumber these tables, and reposition their captions appropriately.
- Section-numbered figures (e.g., 1.2, 3.5) should appear within the appropriate section—Figure 4.8 falls within section 4, for example. If it cannot fit within the same section, it must appear on a facing page. Note this for the compositor.

7.2. Captions

A caption consists of two parts—the numbered enunciation and any text that follows it. The default spec for captions is 24 pica maximum width set in 10 point CM font (the same size as the text). Figure captions always appear *centered under* the figure.

If a caption appears in smaller type than that used for the text, flag it for the compositor to restore to default values.

- The numbered enunciation appears in caps and small caps font, e.g., FIGURE 7.
- The caption text is roman and in sentence style (never headline style).
- End punctuation is only required when a caption is a full sentence and not for short descriptive phrases. However, if the author has added a period to all short descriptive phrases, please follow the author's lead and make it consistent.

A figure may have multiple parts. Each part of a figure should be labeled logically and unambiguously. If the author has included the label within the image, then leave it as is. If a label has to be added, it can appear to the left of a horizontal row of figures (if it is labeling the full row) or centered under the image if it labels what appears above, e.g., (a), (b), (c); see Figures 5 and 6 (p. 50).

7.3. Permissions

Occasionally authors reprint figures from other sources. The author is responsible for obtaining a letter from the copyright holder (typically the publisher of the original book or journal) that grants permission to reprint the figure. A permission line must be added to the caption, giving credit to the original source. If publishers request specific wording for these lines, the wording is given in the permission letter and must be used verbatim. If no specific wording is requested, the permission statement takes the form "Reprinted with permission from XYZ" or "courtesy of XYZ, used with permission", where "XYZ" refers to the copyright owner. (This may be an individual, a publication, a publisher, a library collection, a university, an agency, etc.)

If you suspect a figure has been borrowed from another source but there is no permission letter, query the author and inform the AMS. The author or the publisher may have to request permission.

The copy editor's read of the paper also functions as a "safety net" for catching missing permissions. Please be vigilant about any hints within the text or captions that would indicate outstanding permissions issues.

Examples of what to look for as "hints" include (but are not limited to) a mention of thanks to someone other than the author(s), clear visual inconsistency between the figure in question and others appearing in the paper, etc.

The following captions are examples of two permissions statements. The images are not included—you know, permissions issues!

FIGURE 12. The moduli space $\mathcal{H}^2/PSL(2,\mathbb{Z})$ (courtesy of Carlos Matheus, used with permission)

FIGURE 13. Hofstadter's butterfly. Reprinted with permission as follows: Douglas R. Hofstadter, *Energy levels and wave functions of Block electrons in rational and irrational magnetic fields*, American Physical Review B **14** (1976), 2239–2249. Copyright 1976, American Physical Society.

7.4. Figure placement and text callouts

When an author's original manuscript is run through the AMS production system, figure placement may change. As part of the initial review of any manuscript with figures, the copy editor should mark in the AMS output the *original* location of each repositioned figure. Any problems this may cause during paging will be addressed by the compositor.

- Figures should always be cited in full (e.g., Figure 3) as the AMS treats them as proper nouns. Abbreviated forms (e.g., Fig. 3) are not allowed. (This is a break with CMS guidance.)
- In-text callouts to multipart figures should appear as, e.g., "Figure 3.4(a)" with no space between the figure number and the figure part number.
- In-text callouts to *numbered* figures appearing as, e.g., "in the figure above" or "in the figure below" must be changed to, e.g., "in Figure 3.4".
- All figures should be listed in the Numbering System portion of the style sheet, and the copy editor should check off each one as it is called out in the text.
- If a numbered figure is not cited in the manuscript, insert a callout for it when its location is obvious and flag it for the author. If the location for the callout is not obvious, query the author for the appropriate location.
- ***Numbered* figures may appear at the top, bottom, or middle of a page**, but they never appear *midparagraph* in the middle of a page. (This rule does not apply when figures appear at the top or bottom of a page since paragraphs often break across pages.)
- ***Unnumbered* figures may appear within sentences or midparagraph**. These are part of the surrounding text and cannot be separated out. Leave a note for the compositor that they have to stay where they are.

7.5. Sizing and altering figures

The copy editor's role in sizing figures is limited. Sizing figures at this stage should only be to ensure they fit within the text block (a maximum of 30 picas wide by 45.5 picas long with a one-line caption). Figures may be altered at a later stage to accommodate paging, so sizing now is not final.

Figures are proofread against the author's original manuscript, and any obvious problems in figures should be flagged. "Obvious problems" include such things as any text within the figure that has moved from where it

appeared in the author's original figure, text or caption references to colors that do not match the figure, type that has disappeared, etc. For any such inconsistencies leave a query for the author and the AMS.

7.6. Landscape figures

This is an unusual item. The AMS strongly prefers to reset a figure in a portrait orientation whenever possible. However, sometimes figures simply will not shrink for our convenience, and they must be set landscape. Figures 7 and 8 (p. 51) are just two examples of figures that could not be reduced to fit.

In order to set a figure landscape, it must appear on a separate page from the text. For this reason, the positioning of landscape figures is more approximate. The copy editor should note where landscape items fell in the original manuscript, and the compositor will place them as close as possible to that original position.

7.7. Some examples

Here are some standard examples.

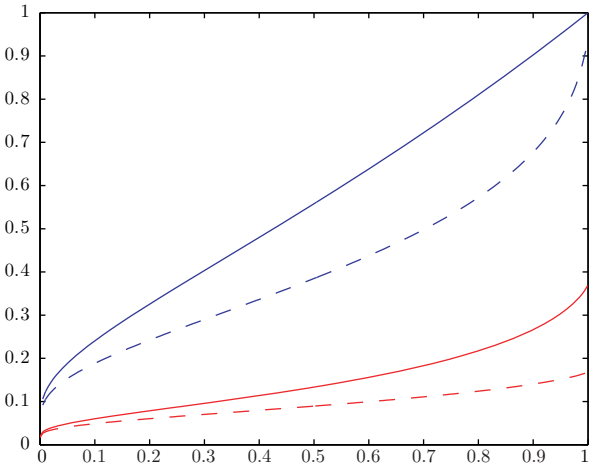


FIGURE 4. Thresholds for $\delta \in (0,1)$ from top to bottom: ρ_W^+ (solid blue), $\rho_W^\pm$ (dashed blue), ρ_S^+ (solid red), $\rho_S^\pm$ (dashed red).

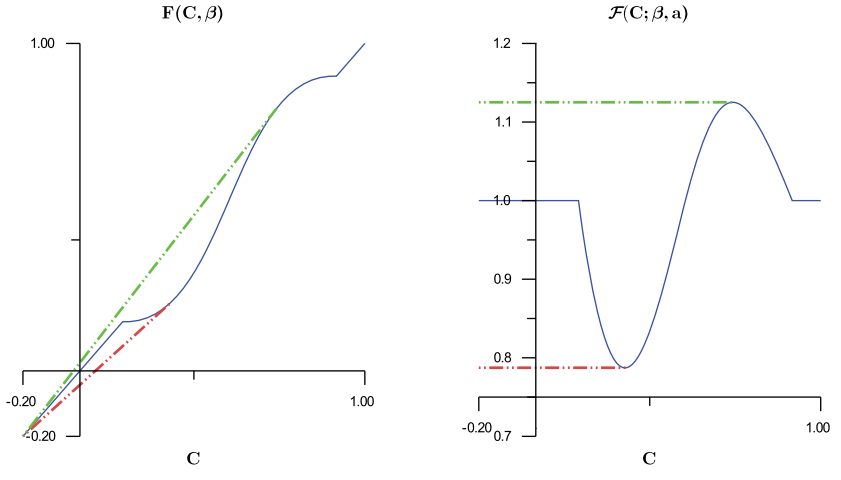


FIGURE 5. Functions $F(C, \beta)$ and $\mathcal{F}(C; \beta, a)$. $a = 0.2$ on the left plot.

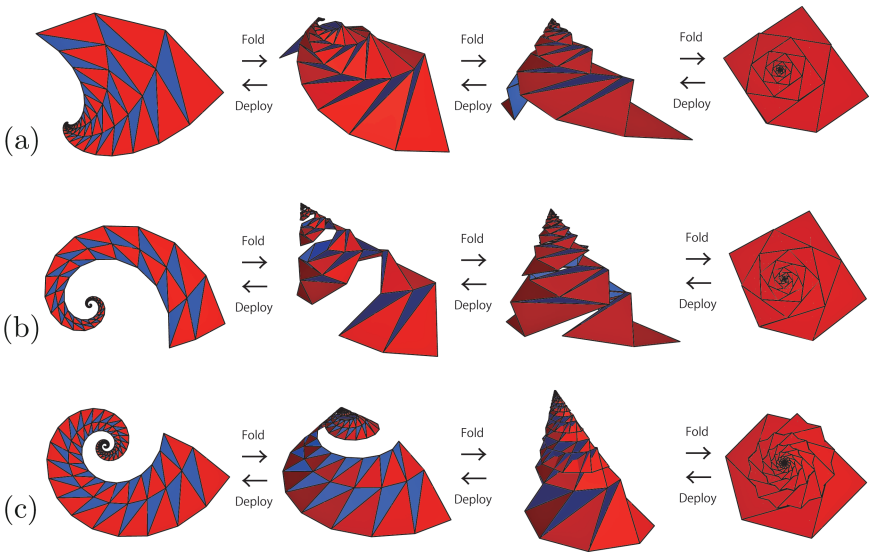


FIGURE 6. Three examples of the one-DOF folding motion of Design Method 5. (a) An origami sheet of Figure 5(a). (b) An origami sheet for a triangular spiral tiling of Figure 2(c). (c) An origami sheet of a spiral multiple tiling by right triangles with the angles 30°, 60°, and 90°.

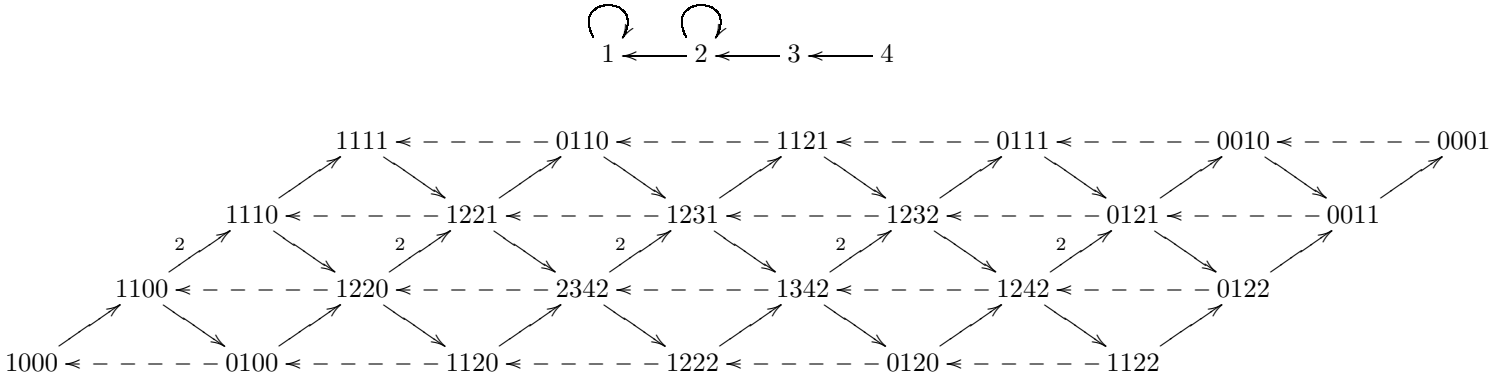


FIGURE 7. Type F_4, Case 1

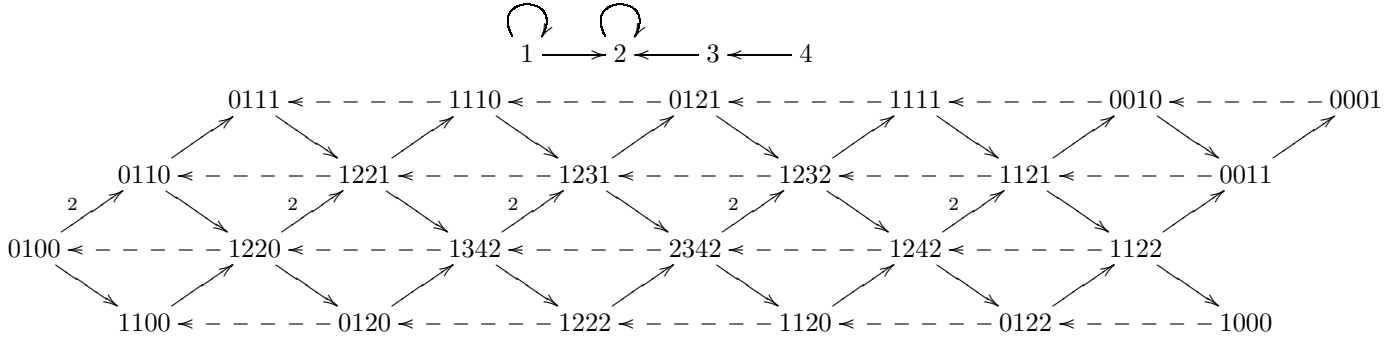


FIGURE 8. Type F_4, Case 2

Chapter 8

Tables

When authors submit their LaTeX files for publication, the tables have been coded. Their numbering, cross-references, and caption placement and punctuation all need to be reviewed for style consistency. When reading the text, the copy editor should compare the terms in the tables against how those same terms are used in the text and mark for consistency.

The AMS allows authors very wide latitude on wording their captions: these captions can be a simple table number or a more lengthy explanation of the data within and the methods used to compile it. Other than placing captions at the top of all tables and sizing wide tables to fit within the text block, we do not enforce any other specs on table format.

Author-coded tables run through the AMS production system are generally stable, but misreads occur once in a while. For this reason **the copy editor must compare each table in the AMS copy against the author's original submission**. This is just a quick comparison of the two versions for obvious errors (e.g., table elements appearing in the wrong column). If any are found, note it for the compositor and include the location of the table in the original manuscript.

Tables are generally placed near where they are first cited, but occasionally very long tables may appear near the end of an article, though always before the references. Tables that are extremely long (over 10 pages) can be put online and referenced by a linked URL. These tables are the responsibility of the author, and the copy editor should only confirm that the link is correct.

All *numbered* tables must carry an in-text callout so that each table will be linked to the text in the online version. If a numbered table has no

cross-reference, please either add it or query the author about where the cross-reference should go.

8.1. Numbering

Table numbers follow the same rules as described in section 3.2, but AMS's strong preference is that tables should be numbered independently of other numbered enunciations, including figures. Please note the the AMS does not use hyphens in section-numbered tables (e.g., Table 8-1 is not acceptable).

Tables may either be numbered consecutively throughout the paper or be numbered within sections, regardless of whether other numbered enunciations have section numbers. If there are just a few tables, it is perfectly acceptable to allow table numbering to run consecutively through the paper without reference to the section numbers.

Table numbering may require adjustment for several reasons.

- Any gaps or duplications in numbering must be edited to be in sequence, and any missing or incorrect in-text callouts must be added or corrected, respectively.
- The author may have numbered a table as a figure. Relabel and renumber these impostors, and reposition their captions appropriately.
- Section-numbered tables (e.g., 1.2, 3.5) should appear within the appropriate section—Table 4.8 falls within section 4, for example. If it cannot fit within the same section, it must appear on a facing page. Note this for the compositor.
- Extremely long tables that break across pages must be numbered, if they are not already.
- If there is no text callout, insert one if its location is obvious or query the author about where the cross-reference should go.
- Tables numbered with roman numerals or letters should be left as is.

8.2. Captions

A caption consists of two parts—the numbered enunciation and any text that follows it. The default spec for captions is 24 pica maximum width set in 10 point CM font (the same size as the text). Table captions always appear *centered above* the table. If a caption appears in smaller type than that used for the text, flag it for the compositor to restore to default values.

- The numbered enunciation appears in caps and small caps font, e.g., TABLE 7.
- The caption text is roman and in sentence style (never headline style).

- End punctuation is only required when a caption is a full sentence and not for short descriptive phrases. However, if the author has added a period to all short descriptive phrases, please follow the author's lead and make it consistent.

8.3. Permissions

Occasionally authors reprint tables from other sources. The author is responsible for obtaining permission from the copyright holder (typically a letter or email from the publisher of the original) that grants certain publishing rights to the AMS. A permission line must be added to the caption, giving credit to the original source. If publishers request specific wording for these lines, the wording is given in the permission letter and must be used verbatim. If no specific wording is requested, the permission statement takes the form "Reprinted with permission from XYZ" or "courtesy of XYZ, used with permission", where "XYZ" refers to the copyright owner. (This may be an individual, a publication, a publisher, a library collection, a university, an agency, etc.) Two examples from figure captions are given on p. 47.

If you suspect a table has been borrowed from another source but there is no permission letter, query the author and inform the AMS. The author or the publisher may have to request permission.

The copy editor's read of the paper also functions as a "safety net" for catching missing permissions. Please be vigilant about any hints within the text or captions that would indicate outstanding permissions issues.

Examples of what to look for as "hints" include (but are not limited to) a mention of thanks to someone other than the authors, clear visual inconsistency between the table in question and any others appearing in the paper, etc.

8.4. Table placement and text callouts

When an author's original manuscript is run through the AMS production system, table placement may change. As part of the initial review of any manuscript with tables, the copy editor should mark in the AMS output the *original* location of each repositioned table. Any problems this may cause during paging will be addressed by the compositor.

- Tables should always be cited in full (e.g., Table 3) as they are proper nouns. Abbreviated forms (e.g., Tab. 3) are not allowed. (This is a break with CMS guidance.)
- In-text callouts to *numbered* tables appearing as, e.g., "in the table above" or "in the table below" must be changed to, e.g., "in Table 3.4".

- All tables should be listed in the Numbering System portion of the style sheet, and the copy editor should check off each one as it is called out in the text.
- If a numbered table is not cited in the manuscript, insert a callout for it when its location is obvious, and flag it for the author. If the location for the callout is not obvious, query the author for the appropriate location.
- Text within a table should be edited to conform to usage within the paper.
- ***Numbered*** **tables may appear at the top, bottom, or middle of a page**, but they never appear *midparagraph* in the middle of a page. (This rule does not apply when tables appear at the top or bottom of a page since paragraphs often break across pages.)
- **Small *unnumbered* tables may appear within paragraphs**. If these are part of the surrounding text and cannot be separated out, leave them where they fall, and also leave a note for the compositor that the table must remain where it is.

8.5. Sizing and altering tables

Sizing tables at this stage should only be to ensure they fit within the text block (a maximum of 30 picas wide by 45.5 picas long with a one-line caption). This may involve point size reduction of the table; please leave a note for the compositor to fit the table within the margins. Tables may be further altered or broken across pages at a later stage to accommodate paging, so sizing now is not final.

Tables are reviewed against the author's original manuscript, and any obvious problems in tables should be flagged. "Obvious problems" include such things as a change in alignment between the original version and the AMS output, any missing or mangled elements, etc. Leave a query for the compositor if it is an alignment problem, and include the location of the table in the original manuscript.

8.6. Landscape tables

The AMS strongly prefers to reset a table in a portrait orientation, whenever possible. However, some tables simply cannot be reduced enough, and these will be set landscape. Table 4 (p. 59) is an example of a table that could not be reduced to fit.

In order to set a table landscape, it must appear on a separate page from the text. For this reason, the positioning of landscape tables is more

approximate. The copy editor should note where landscape items fell in the original manuscript, and the compositor will place them as close as possible to that original position.

8.7. Some examples

Here are some standard examples.

TABLE 1. Proof of Example 2.19 in the case $k = 1$

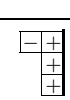
$((r,s),\mu)$	(L,z)	λ	x	W	(n_1,n_2) (W,L)	(τ,i)
	$\begin{pmatrix}*\\0\\0\\\hline 0\end{pmatrix}, \left(\begin{array}{ccc\|c}0&0&0&1\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$	$(2,1^2)$	$\left(\begin{array}{ccc\|c}0&\alpha&\beta&1\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$ $\alpha,\beta\in\mathbb{C}$	$\begin{pmatrix}*\\0\\0\\\hline 0\end{pmatrix}$	$(1,0)$ $L = W$	$\left(\begin{array}{\|c\|c\|}\hline 0&0\\\hline 0\\\cline{1-1}2\\\cline{1-1}\end{array}, 2\right)$
	$\begin{pmatrix}0*\\0\\\hline 0\end{pmatrix}, \left(\begin{array}{ccc\|c}0&0&0&1\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$	$(2,1^2)$	$\left(\begin{array}{ccc\|c}0&0&0&1\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$	$\begin{pmatrix}*\\0\\0\\\hline 0\end{pmatrix}$	$(1,0)$ $L \not\subset W+V_2$	$\left(\begin{array}{\|c\|c\|}\hline 0&0\\\hline 0\\\cline{1-1}2\\\cline{1-1}\end{array}, 0\right)$
	$\begin{pmatrix}0*\\0\\\hline 0\end{pmatrix}, \left(\begin{array}{ccc\|c}0&0&0&0\\0&0&0&0\\\hline 1&0&0&0\end{array}\right)$	$(2,1^2)$	$\left(\begin{array}{ccc\|c}0&0&0&0\\\alpha&0&0&0\\\hline 1&0&0&0\end{array}\right)$ $\alpha\in\mathbb{C}$	$\langle\begin{pmatrix}0\\\alpha\\\hline 1\end{pmatrix}\rangle_{\mathbb{C}}$	$(0,0)$ $L\subset W+V_2,\ L\not\subset W$	$\left(\begin{array}{\|c\|c\|}\hline 0&1\\\hline 0\\\cline{1-1}1\\\cline{1-1}\end{array}, 1\right)$
	$\begin{pmatrix}*\\0\\0\\\hline 0\end{pmatrix}, \left(\begin{array}{ccc\|c}0&0&0&0\\0&0&0&0\\\hline 1&0&0&0\end{array}\right)$	$(2,1^2)$	$\left(\begin{array}{ccc\|c}0&0&0&0\\0&0&0&0\\\hline 1&0&0&0\end{array}\right)$	V_2	$(0,1)$ $L \not\subset W+V_2$	$\left(\begin{array}{\|c\|c\|}\hline 0&2\\\hline 0\\\cline{1-1}0\\\cline{1-1}\end{array}, 0\right)$
	$\begin{pmatrix}*\\0\\0\\\hline 0\end{pmatrix}, \left(\begin{array}{ccc\|c}0&0&0&0\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$	(1^4)	$\left(\begin{array}{ccc\|c}0&0&0&0\\0&0&0&0\\\hline 0&0&0&0\end{array}\right)$	any line	$(0,0)$ $L \not\subset W+V_2$	$\left(\begin{array}{\|c\|c\|}\hline 0&1\\\hline 0\\\cline{1-1}1\\\cline{1-1}\end{array}, 0\right)$

TABLE 2. Model parameters used for the numerical computations.

Symbol	Value	Definition
σ_i	0.455	intracellular conductivity
σ_e	5	extracellular conductivity
L	2×10^{-4}	computation domain size
r	0.5×10^{-4}	cell radius
δ	5×10^{-9}	membrane thickness
r_p	0.76	pore radius
σ_p	0.0746	pore conductivity
V_{ep}	0.258	characteristic voltage of electropermeabilization
α	10^9	electropermeabilization parameter
N_0	1.5×10^9	equilibrium pore density
c_m	9.5×10^{-12}	membrane capacitance

TABLE 3. Changes in microscopic parameters and the reaction of the effective parameters in equation (6.3)

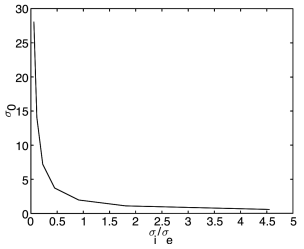
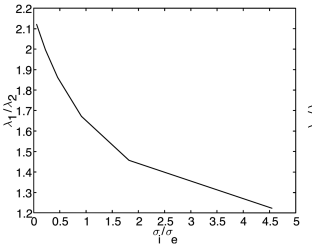
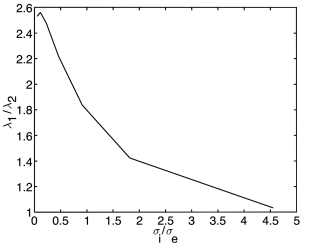
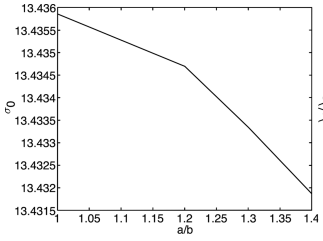
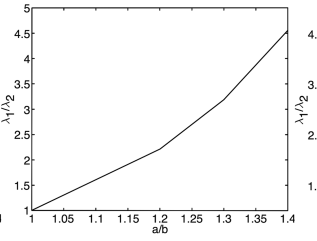
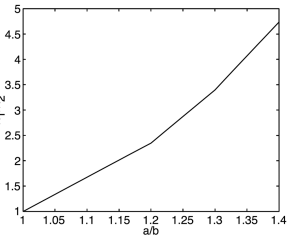
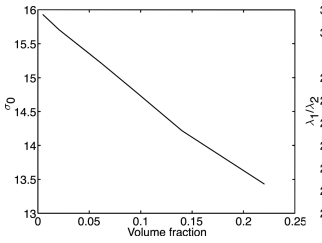
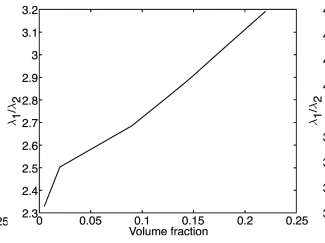
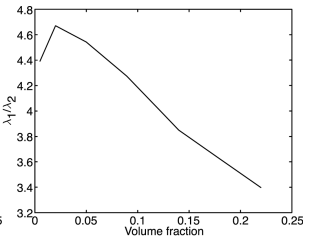
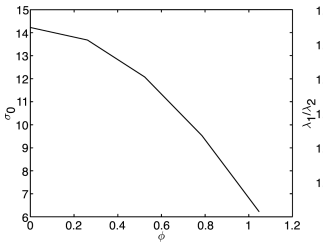
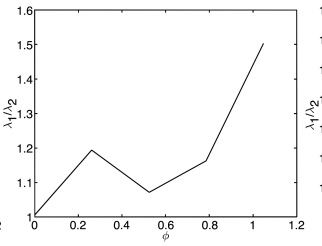
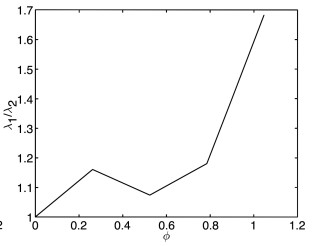
effective conductivity σ_0	eigenvalues λ_1/λ_2 of A^0	eigenvalues λ_1/λ_2 of $A^1(0)$
Example 1: Difference in conductivity		
		
Example 2: Difference in cell shape: change of the excentricity a/b		
		
Example 3: Difference in volume fraction of the cells		
		
Example 4: Difference in angle ϕ of the lattice arrangement		
		

TABLE 4. Ordering 1-PS's up to duality, III

1-PS λ	strictly positive isotypical summands of $\bigwedge^3 \lambda$					
$(7, 4, 1_2, -2, -11)$	012, 013 t^{12}	014, 023 t^9	024, 034, 123 t^6	124, 134 t^3		
$(7, 4_2, -2, -5, -8)$	012 t^{15}	013, 023 t^9	014, 024, 123 t^6	015, 025, 124 t^3		
$(7_2, 1_2, -5, -11)$	012, 013 t^{15}	014, 023, 123 t^9	015, 024, 034, 124, 134 t^3			
$(8, 5, 2, -1, -4, -10)$	012 t^{15}	013 t^{12}	014, 023 t^9	024, 123 t^6	015, 034, 124 t^3	
$(10, 7, 1, -2, -5, -11)$	012 t^{18}	013 t^{15}	014 t^{12}	023 t^9	015, 024, 123 t^6	034, 124 t^3
$(10, 7, 4, -2, -8, -11)$	012 t^{21}	013 t^{15}	023 t^{12}	014, 123 t^9	015, 024 t^6	025, 124 t^3
$(11, 5, 2, -1, -4, -13)$	012 t^{18}	013 t^{15}	014, 023 t^{12}	024 t^9	034, 123 t^6	015, 124 t^3
$(11, 5_2, -1, -7, -13)$	012 t^{21}	013, 023 t^{15}	014, 024, 123 t^9	015, 025, 034, 124 t^3		
$(11, 8, 2, -1, -7, -13)$	012 t^{21}	013 t^{18}	014, 023 t^{12}	123 t^9	015, 024 t^6	034, 124 t^3
$(11, 8, 5, -4, -7, -13)$	012 t^{24}	013 t^{15}	014, 023 t^{12}	024, 123 t^9	015, 124 t^6	025 t^3
$(13, 7, 1_2, -5, -17)$	012, 013 t^{21}	014, 023 t^{15}	024, 034, 123 t^9	015, 124, 134 t^3		
$(17, 11, 5, -1, -13, -19)$	012 t^{33}	013 t^{27}	023 t^{21}	014, 123 t^{15}	015, 024 t^9	025, 034, 124 t^3
$(19, 13, 7, -5, -11, -23)$	012 t^{39}	013 t^{27}	014, 023 t^{21}	024, 123 t^{15}	015, 124 t^9	025, 034 t^3

Chapter 9

Appendices

Appendices are optional. They appear after the body of the paper but before acknowledgments or references.

9.1. Form

An appendix may appear in the manuscript numbered as a section of the paper, appear without a number, or be identified by a roman numeral or letter. Any of these forms is acceptable. It is acceptable to have an Appendix A without subsequent Appendices A, B, C, etc., if the author coded it that way, though when there are no other appendices, the AMS prefers that a single appendix be simply labeled "Appendix". An appendix head is the same as a section head (see p. 27), and any text following it begins in a paragraph below. Here are some examples of appendix head styles.

APPENDIX

APPENDIX A

8. APPENDIX

APPENDIX. DETAILS OF THE BLOCKWISE CONVERTER

A copy editor may move a very long table (e.g., more than six pages) into an appendix if it interrupts the text too much. This sort of change requires a query to the author for approval.

9.2. Text callouts

Callouts to appendices follow the same form as for sections.

- Two or more appendices are cited in text as "see Appendices A and B" and "see Appendices A, B, and C", not as "see Appendix A and Appendix B."
- Every section callout must include the word "Appendix". If the author cites a lettered appendix using §A, change it to say "Appendix A", as the § symbol does not apply to appendices. In the unusual circumstance that the author simply refers to a section within the appendix (e.g., D.3) please edit to include the complete callout (e.g., Appendix D.3). When in doubt, query the author.
- If text callouts must be changed, leave a note describing the problem, and the compositor will manage it.
- The word "Appendix" is capitalized in a callout only if the cited appendix is numbered or lettered.
  - See Appendix B.
    [Numbered or lettered appendices are proper nouns.]
  - See the appendix.
    [Unnumbered or unlettered appendices are referred to generically.]

Chapter 10

References

The AMS uses a program (`addmr`) that checks all references against its curated database, *MathSciNet* (MSN).[1] During this process, when the program finds a match in MSN, the original reference is replaced with that from MSN. This alleviates many format problems, but the copyeditor must ensure that the correct substitution has been made. The other essential check is that the copyeditor review any unchanged references for consistency with the MSN versions. Because of the very high substitution "hit rate", there are rarely many unchanged references. But there can be wildly different forms for the references, which will be obvious when reviewing the originals interspersed with the MSN substitutions.

10.1. Reference checking

There are two tracks for editing journal references since they all have been run through the `addmr` program:

- check that the MSN substitutions match the author's original reference, and
- check that any original references are consistent with MR style.

[1]Some essential terminology: MR stands for Mathematical Reviews, a division of the American Mathematical Society; MSN stands for *MathSciNet*, the database of Mathematical Reviews listings; and an MR number is the number assigned to each review within the database.

It is typical that there are only a few references that remain in their original form. The copyeditor will need the following:

- the AMS output copy intended for the copyeditor's markups,
- the author's original submission of the article.

The steps below outline the two tracks of editing and what to look for. Note that the *MSN-replaced items will be the standard to follow*, and the remaining originals need to mirror that style.

Working in the AMS copy, do a copycheck of all references against the author's original version. (Note: A *copycheck* is a quick glance at the author name(s), title, journal or book series, dates, and any additional information to ensure that the correct MSN entry has been added and that all the elements are there and in the correct order. This is *not* a character-by-character proofread!) If there is a problem with the `addmr` substitution, it is usually glaringly obvious. For the references that now have an MR number, you will follow track (1); for those without, track (2).

(1) Copycheck each MSN-replaced reference on the AMS copy against the author's original to confirm that the MSN substitutions match the author's original. Occasionally, a reference is changed to a wildly different MSN item during the `addmr` process. In this case, simply mark the reference for "revert" in the right margin and continue to the next reference.

There are some known problems with the MSN substitutions. A common example is that any subtitles or notes may appear in the wrong location within the reference or in roman (instead of italic) font. Check the correct order and mark for the compositor to fix. A light copycheck of each reference element will make such problems obvious.

(2) When reviewing references in their original (unchanged) form, make sure the author names are in the same order as the MSN substitutions (e.g., first name or initial then last name) and that the fonting of the reference elements matches that used in the MSN substitutions.

The only time a 3-em line will appear in the references is in an unchanged reference. In each case, please replace the 3-em line with the appropriate name or names.

Personal communications or `arXiv` items should **not** have an MR number. Items from `arXiv` should appear as author, *title*, `arXiv` number, year.

10.2. Reference examples

The two examples below (in both their wrong and corrected versions) show references in which, after being run through `addmr`, the series was moved to the end of the reference entry, instead of following the title. This problem is exclusive to books in a series.

✘ M. Golubitsky and V. Guillemin, *Stable mappings and their singularities*, Springer-Verlag, New York–Heidelberg, 1973. Graduate Texts in Mathematics, Vol. 14. MR0341518

✓ M. Golubitsky and V. Guillemin, *Stable mappings and their singularities*, Graduate Texts in Mathematics, Vol. 14, Springer-Verlag, New York–Heidelberg, 1973. MR0341518

✘ Melvin S. Berger, *Nonlinearity and functional analysis*, Academic Press [Harcourt Brace Jovanovich Publishers], New York–London, 1977. Lectures on nonlinear problems in mathematical analysis; Pure and Applied Mathematics. MR 0488101

✓ Melvin S. Berger, *Nonlinearity and functional analysis*, Lectures on nonlinear problems in mathematical analysis, Pure and Applied Mathematics, Academic Press [Harcourt Brace Jovanovich Publishers], New York–London, 1977. MR 0488101

The next examples show a paper that is posted to `arXiv`.

✓ O. A. Camarena and B. Szegedy, *Nilspaces, nilmanifolds and their morphisms*, `http://arxiv.org/abs/1009.3825` [math.DS], 2012.

✓ O. A. Camarena and B. Szegedy, *Nilspaces, nilmanifolds and their morphisms*, arXiv:1009.3825, 2012.

This example shows a DOI number (always welcome, and please note its location) and also how extraneous material can be transferred during the `addmr` process. Since the dedication does not assist a researcher in finding the item, it should be deleted. It is likely that it was not in the author's original manuscript either.

✘ Clifford J. Earle, *Some remarks on the Beltrami equation*, Math. Scand. **36** (1975), 44–48, DOI 10.7146/math.scand/a-11561. Collection of articles dedicated to Werner Fenchel on his 70th birthday. MR0374417

✓ Clifford J. Earle, *Some remarks on the Beltrami equation*, Math. Scand. **36** (1975), 44–48, DOI 10.7146/math.scand/a-11561. MR0374417

10.3. Reference citations

There are several styles of reference citations, and the copy editor must check that the form in the AMS output matches the author's original manuscript. The most common style is a number within brackets, e.g., [1], [2]. The next most common style is a short alpha-numeric form, e.g., [Serre71] or (even shorter) [S71]. When multiple authors are involved, the citations become lengthy, e.g., [dlVP-SD04] for de la Valleé-Poussin and Swinnerton-Dyer from 2004.

When reviewing the reference section, if the reference citation overruns the left margin or the hanging indent is too narrow to accomodate long citations, the copy editor must determine which is the *widest* citation. Leave a note for the compositor saying, e.g., "AMS: widest is FdBPP12". This information is used to set the correct hanging indent width in the reference section (see, e.g., Figure 3 on p. 22).

[DL99] J. Denef and F. Loeser, *Germs of arcs on singular algebraic varieties and motivic integration*, Invent. Math. **135** (1999), no. 1, 201–232, DOI 10.1007/s002220050284. MR1664700

[FdBPP12] J. Fernández de Bobadilla and M. P. Pereira, *The Nash problem for surfaces*, Ann. of Math. (2) **176** (2012), no. 3, 2003–2029, DOI 10.4007/annals.2012.176.3.11. MR2979864

[Gra58] H. Grauert, *On Levi's problem and the imbedding of real-analytic manifolds*, Ann. of Math. (2) **68** (1958), 460–472. MR0098847

The reference citations within the text must exactly match what appears in the reference section. If an author needs to cite something specific within a referenced work, that information is appended to the citation and is kept within the brackets, e.g., [dlVP-SD04, Thm. 3.9]. In this example, the use of "Thm." is allowed because it is part of the citation. We never change the form used by the author within a citation. While multiple reference citations can appear within a single pair of brackets and be separated by a comma, a reference citation with appended information can only appear singly, e.g., [dlVP-SD04, Thm. 3.9], [Serre71].

Chapter 11

Corrigenda and Errata

A corrigendum[1] or an erratum is an article (usually very short, ranging from a single paragraph to 2–3 pages) submitted to a journal that serves as a correction to an article previously published, typically in that journal. These forms are divided into mathematical corrigenda and publication errata. Because a corrigendum is an article, it must follow the same rules for top and end matter described in Chapter 2. This includes having an abstract, a received date, and MSN numbers. The use of errata has all but disappeared in print as this form now appears online, often well before printing.

- A *mathematical corrigendum* is a correction of the mathematical content of a previously published article. This can be submitted by the author of the original article or by another researcher claiming to have found an error in the original author's paper. Mathematical corrigenda must be approved for publication by the journal editor.
- A *publication erratum* is a correction to an error made by AMS's editorial or production department or by one of AMS's compositors or printers, e.g., a mistake in rendering a correction from the author or a page with missing print. In rare instances it can be an author error that must be corrected, e.g., incorrect or missing grant information that could affect the funding of a project. The decision to publish such an erratum is usually made by the AMS.

[1]Some journal editors also submit "corrections", which follow the same rules as corrigenda. The AMS honors the journal editor's choice of either "corrigendum" or "corrections".

11.1. Title and running heads

The title of mathematical corrigenda appears as follows:

CORRIGENDA TO "[TITLE OF ORIGINAL ARTICLE]"

As explained in Chapter 2, the title will print in all caps, but the copy editor should mark for caps and lowercase so the electronic version of the title appears correctly.

Both running heads are simply "CORRIGENDA". The AMS accepts either the singular or plural form as submitted by the author or journal editor.

11.2. Abstract and other top matter

The abstract of the corrigendum contains the rest of the bibliographic information for the original article. Some authors choose to include a statement of the reason for the corrigendum. In the abstract, specific bibliographic information is included, as the author requests. It may be only the journal name, volume, date, and pages, or it could include a complete reference to the paper, including the author names.

Abstract. It has been brought to our attention that there is an error in the statement of Theorem 2.2 of our article, which appeared in Math. Comp. 83 (2014), no. 289, 2127–2160. We briefly explain how this error can be corrected.

Abstract. This corrigendum makes two corrections to J. Kollár and S. Mori, "Classification of three-dimensional flips", J. Amer. Math. Soc. 5 (1992), 533–703.

Abstract. Typographical errors which changed important definitions in the paper "Vector measures and the strong operator topology" (Proc. Amer. Math. Soc. 137 (2009), 2345–2350) are addressed.

Abstract. The authors correct an error in the grant information for "Global dynamics of a Yang-Mills field on an asymptotocally hyperbolic space", Trans. Amer. Math. Soc. 369 (2017), 2029–2048.

Write out the complete citation of the original article in the abstract. In most cases, the original article must be one of the references (often it will be the only reference), and this reference must be cited in the text (usually at the very beginning). Please recall that linked items such as references cannot appear within any abstract.

Part 2

Editing and Style

Introduction to Part 2

Many people wonder how one can successfully edit a research-level mathematics paper without understanding the math. Briefly, an experienced copy editor will need to be familiar with the mechanics of mathematical language (especially math symbols as parts of speech) in order to copyedit papers for basic grammar, correct punctuation, clear and concise syntax, and consistency with AMS style. In-text math and displayed equations should be edited as lightly as possible.

The most important consideration to bear in mind when editing is the Hippocratic oath: **First, do no harm**. The publishing mission of the AMS is to provide services for its members, which by extension includes subscribers and authors. Always keep in mind that we must put their needs first. The primary manifestation of that attitude is a light editorial hand. There are two reasons for this:

(1) Editorial changes may affect the meaning of the content. When in doubt, query AMS staff or the author.

(2) Any change takes up the time of three people—the copy editor, the compositor, and the proofreader. Is the change really worth it?

Within this part of the *AMS Style Guide*, we explain our grammatical, syntactical, stylistic, and mathematical preferences for copyediting. No part of this guide exists separately from another—the copyeditor really does need to learn all the rules. And then practice them!

Printed in both Chapters 12 and 13 is a table showing some mathematical symbols and what part of speech they represent. This table is the basis for translating mathematical symbols into grammar, and it will be among your most important tools while learning how to edit mathematics.

Elementary rules of copyediting anywhere

- Look up the spelling of every unfamiliar term.
- When reference information is mentioned in text, double-check it against the bibliography.
- Keep a style sheet for consistency of formatting of terms.
- Consult grammar sources regarding points about which you are unsure.
- Remember that every publisher has its own style manual that must be followed.

Some additional rules of copyediting for the AMS

- Any numbered item—theorem, reference, equation, and so on—should be listed on the style sheet (see Figure 1). With this list the copy editor can check all cross-references at a glance.
- Bad line breaks (most frequently in math) and line overruns need to be fixed, and short, long, or overly spacy pages must be marked for review at paging.
- All numbered figures and tables need in-text callouts so they will link in the online and hypertext versions of the paper.

Chapter 12

Editing Text

Having set up some basic guidelines for the approach to working on an AMS paper in Chapter 1, and having presented the various elements of an AMS journal paper top and end matter in Chapter 2 and its text elements in Chapter 4, we can now get down to the business of editing the text of a mathematical paper. In Chapter 13 we will discuss the details of editing the mathematics.

Here are some broad strokes: The basic work process described in Chapter 1 will be your road map through this multilayered but logical process. An understanding of the material in Chapters 2 and 4 will be essential to completing the checklist (Figure 1) and ensuring compliance with AMS journal format requirements. When starting a paper, review the numbering systems and list them on the checklist so you'll have all the cross-references to numbered enunciations *at a glance* during the edit (cross-references to citations in the references will have to be confirmed individually). A paper may contain sections and subsections; numbered or unnumbered theorems, remarks, definitions, etc.; in-text (unnumbered) or displayed (sometimes numbered) equations; footnotes; figures; and tables. **The AMS requires that all reference citations, numbered figures, and numbered tables be linked.** The copy editor will be able to identify any linked element because each will appear with its number highlighted (a linked number prints with a gray screen and it shows with an underscore in an electronic version; see Appendix G, recto pages).

12.1. Basic editing

The AMS uses *The Chicago Manual of Style, 16th Edition* (CMS), as its principal source of guidance for both grammar and style, but there are many deviations throughout this guide. *The Elements of Style* by Strunk and White is a marvelous and very brief source for grammatical information and guidance. Additionally, *Mathematics into Type* is the principal guidance on handling mathematical typesetting in publishing, and *Words into Type* remains a solid and sensible reference for anything not found in the others.

- Read the paper carefully and correct errors in grammar, spelling, and usage.
- Correct incomplete sentences, dangling participles, and disagreement in number, gender, or tense.
- Edit to improve wording and sense *only as needed.* Different authors may write separate sections of the paper; edit the paper for consistency of style throughout (capitalization, hyphenation, prefix form, etc.), but allow the different voices to be heard.
- Allow British spellings when consistent within a paper, but change all to American if the author has mixed British and American spelling.
- Papers by English-as-a-second-language (ESL) authors need special attention, particularly to idioms, articles, pronouns, and verbs.
- Impose and maintain a consistent style for spelling (e.g., "parameterize" or "parametrize", but not both), punctuation, and treatment of compounds (e.g., "first-order equation" or "equation of first order", hyphenated or open; "time-step" or "timestep", hyphenated or closed); mathematical expressions (e.g., 1000 versus 1,000; 2-norm versus two-norm); reference citations (e.g., [1], [2], [3] or [1, 2, 3]); numbering (e.g., Theorem 1 or Theorem 1.1); and formatting. Note all stylistic decisions on the style sheet.
- Check the title, running heads, abstract, and section heads to make sure usage (spelling, hyphenation) is consistent with the text.
- On the style sheet there is a space at the bottom for keeping a list of numbered enunciations—section numbers; numbers of lemmas, theorems, remarks, etc.; equation numbers; and figure and table numbers. As you create this list, you will be able to see any anomalies in the numbering system, and these will have to be resolved.
- Many authors do not punctuate series of equations even if their text punctuation is acceptable. We edit to include this punctuation. See Chapter 13.

- Figures and tables are placed within the same section as their callouts, generally on either the same page or the following page. Numbered figures and tables must not appear midparagraph if located in the middle of a page. See Chapters 7 and 8 for instructions for styling figures and tables.
- Mark unlinked reference citations, numbered figures, and numbered tables to be linked.
- Overly large spaces between paragraphs, headings, and displays can occur when long displayed equations, figures, or tables fall awkwardly relative to page breaks. These should be noted by the copy editor, and they will be reviewed at final paging.
- Lines may spread because of accents, symbols atop variables, or large in-text mathematical expressions. This vertical spread is unavoidable.

Note: We allow references to other pages within a single journal paper, but each such occurrence must be marked for `pageref` coding, which the compositor will manage and which will update the page number each time the paper is run through LaTeX.

12.2. Mathematical symbols in text

Here we begin discussing mathematics in text. **It is necessary to group mathematical symbols into parts of speech**. Below are some common symbols that will shape the discussion; Table 12.1 of CMS contains a more complete list. The copy editor will need copies of both lists close at hand until recognizing the symbols by their part of speech becomes natural. This table also appears in Chapter 13 because of its foundational importance in learning how to edit mathematical text.

Operators:

Verbs: $= \neq < > \leq \geq \prec \succ \ll \gg \nleq \ngeq \subset \supset \in \ni \equiv \not\equiv \sim \not\sim \simeq \cong \to \leftarrow \Rightarrow \Leftrightarrow \notin$

Conjunctions: $+ \; - \; \times \; \dot{+} \; \mp \; \cup \; \cap \; \vee \; \wedge \; \cdot \; \circ \; \oplus \; \otimes$

Fences: { } [ ] $\langle \rangle$ ( ) | | $\|$ $\|$

Nouns: italic, Greek, German, Hebrew, and Cyrillic letters; numerals

Sigma-class symbols:

Collective signs: $\sum \; \prod \; \bigcup \; \bigcap \; \bigwedge \; \bigvee \; \bigoplus \; \bigotimes$

Integral: $\int$

12.3. Type

12.3.1. Blackboard bold. Mark "fake" blackboard bold type to be set as true blackboard bold (see Appendix E).

✘ Fake:	$\mathbb{IR}$
✓ True:	$\mathbb{R}$

The copy editor's mark for this is to circle the fake letter and write "bbb" in the right margin.

12.3.2. Bold. Bold is used for subsection headings; for variables, as set by the author; and in algorithms, as set by the author.

- The AMS strongly prefers to avoid the use of bold text for emphasis. To emphasize a word, use lightface italic (or roman in italic environments). However, stet the author's usage if consistent.
- Most list identifiers are not bold, although the coding for some list structures outputs bold identifiers. Stet bold identifiers only if consistent.

12.3.3. Italics.

- Change slant type to italic.

✘ *This is slant type.*
✓ *This is italic type.*

- The text of theorems, lemmas, and other math items is italic; see Chapter 4 for AMS styling of enunciations.
- Author-created functions may be italic (these are uncommon "siblings" of the standard roman functions cos, sin, log, etc.). Check for consistency and list all of these functions on the style sheet under the Roman or Text Dependent heading, as appropriate. Functions may appear in italics when used as subscripts or superscripts within math mode. Functions listed in Appendix A should all be roman, but if the author is absolutely consistent, the AMS will allow italics. Variables from the Latin alphabet are generally italic (f) but may appear as bold roman ($\mathbf{f}$), bold italic ($\boldsymbol{f}$), roman (f), German (fraktur) ($\mathfrak{f}$), calligraphic ($\mathcal{F}$), or blackboard bold ($\mathbb{F}$). Stet the author's usage, but always change fake blackboard bold to true (see Appendix E).

Roman and italic variables:

$$\mathrm{E}[d^{(j)}(w, R, x \odot Y, Y) - e^{(j)}(w, R, Y)] = \delta_0^{(j)}(w).$$

Bold and italic variables:

$$\sum_{j \in \{0,\ldots,k_n-1\}} c_j \geq k_n \mathbf{p}_n - k_n^{2/3} = m_n + {k_n}^{2/3}.$$

Bold, italic, roman, and calligraphic variables:

$$\mathbf{L_1}(\mathcal{D}, \mathcal{E}) = \sum_{x \in S} |\Pr[\mathcal{D}(x)] - \Pr[\mathcal{E}(x)]| \,/2.$$

- Abbreviations and acronyms are italic within italic text (we call this style "text dependent").
- Punctuation and parentheses within italic text output as italic when used as true punctuation—that is, when not part of math. (Authors occasionally code all parentheses as roman, and this practice is acceptable.) Parentheses that are part of a math expression should always be roman.

The function graph of $F(\lambda) = F(I(\lambda))$ is piecewise linear and convex; we shall denote it by $G(\mathcal{P})$. (The function graph is convex for a maximization problem.)

- Stet the author's use of italics for the first use of a term or for occasional emphasis.

Similarly, a *cycle dag* is a dag whose covering graph is a cycle, a *tree dag* is a dag whose covering graph is a tree, and a *unicyclic dag* is a dag whose covering graph contains a single cycle. A tree dag is *rooted* by selecting an arbitrary node to be its *root.*

12.3.4. Roman.

- Arabic numerals are always set in roman type within italic text, never in italics. This holds for numerals within italic text, mathematical expressions, figure legends, and references, and for numerals used as identifiers within lists, e.g., (1), (i).

  Occasionally, a table will contain a group of numerals set in italics to distinguish these from another group of numerals. Stet this arrangement.
- All letters used to identify parts of figures (Figure 2.1(a)) are roman.

- Latin words or abbreviations that can be found in the dictionary—for example, a priori, et al.—are text dependent (they appear in roman in roman text and in italic in italic text). See Appendix C for a standard list of Latin expressions.
- The functions in Appendix A are roman in math and in text. An author can use almost any term as a function. Author-created functions—those that don't appear in Appendix A—may be set in italics. There is space on the style sheet for you to list all these terms (both roman and text dependent) to help with keeping them consistent throughout a paper. The functions in Appendix A may appear as italic in subscripts and superscripts, however. Make a judgement about whether to fix or stet these based upon frequency of use (if there are a load of them and the author is consistent, let them stand).
- The font for emphasis in roman text is italic, and the font for emphasis in italic text is roman.

12.3.5. Greek, Hebrew, and Cyrillic. In addition to Latin alphabet variables, advanced mathematics also uses Greek, Hebrew, and Cyrillic characters as variables.

- Lowercase Greek characters are always italic (γ, δ, θ). Note that the lowercase Greek letter omicron is indistinguishable from the Latin "o".
- Uppercase Greek characters are always roman (Γ, Δ, Θ). There are about a dozen Greek uppercase letters that are the same as certain letters in the Latin alphabet. These look-alikes are seldom used in math formulas to avoid confusion. There are variants of Greek uppercase letters that appear in italics; see Appendix E.

Greek, Hebrew, and Cyrillic characters as variables:

Greek characters are so common in AMS journals that the copy editor should either learn the Greek alphabet or have Appendix E handy.

$$0 < \lambda_1^\varepsilon(\xi) \le \lambda_2^\varepsilon(\xi) \le \cdots \le \lambda_k^\varepsilon(\xi) \le \cdots \to +\infty$$

Hebrew characters are not encountered frequently, but here are two examples from set theory.

Does GCH $+\square_{\aleph_\omega,\omega}$ imply the existence of an $\aleph_{\omega+1}$-Souslin tree?

$$\mathsf{U}_{\mathrm{fin}}(\Gamma, \beth(\Gamma)) = \mathsf{S}_{\mathrm{fin}}(\Gamma, \beth(\Gamma))$$

The Cyrillic character Ш, or "Sha", is the only one that is regularly used in mathematics.

$$Ш_2(E/\mathbb{Q}) = \{C(1,1)\} \cup \{C(\delta_1,\delta_2) \in \mathrm{Sel}(E/\mathbb{Q} \text{ without points over } \mathbb{Q}\}$$

$$0 \longrightarrow E(\mathbb{Q})/2E(\mathbb{Q}) \longrightarrow \mathrm{Sel}_2(E/\mathbb{Q}) \longrightarrow Ш_2(E/\mathbb{Q}) \longrightarrow 0$$

12.4. Capitalization in lists

A quick digression about lists is in order: Use parallel construction!

- In text, words denoting parts of a list (e.g., step or case) are lowercase, unless the list itself gives the items as Step 1, Case (a), etc.

It is convenient to split it into three regions:
Region 1. $n, \lceil n/2 \rceil$.
Region 2. $\lceil n/3 \rceil$.
Region 3. $\lceil n/(3\cdot 2) \rceil, \ldots, \lceil n/(3\cdot 2^{lb-(i+2)}) \rceil, \ldots$.
In Region 1, b_{i+1} is either n or $\lceil n/2 \rceil$; that is, $i = lb - 1$ or $i = lb - 2$.

Because the list items are given as "Region x", it becomes a proper noun and is capitalized. However, references to list item identifiers that are not "named" are not capitalized.

It is convenient to split it into three regions:
1. $n, \lceil n/2 \rceil$.
2. $\lceil n/3 \rceil$.
3. $\lceil n/(3\cdot 2) \rceil, \ldots, \lceil n/(3\cdot 2^{lb-(i+2)}) \rceil, \ldots$.

In region 1, b_{i+1} is either n or $\lceil n/2 \rceil$; that is, $i = lb - 1$ or $i = lb - 2$.

- Names of theorems, lemmas, concepts, etc., are lowercase (except for proper nouns), e.g., the fast Fourier transform theorem. Numbered theorems, lemmas, etc., are proper nouns and, thus, are capitalized: Theorem 2.2, Lemma 3.1, Figure 4.5.
- The first word of a list item is capitalized only if the item is a complete sentence.

Note the following:
(1) The interval e_p is contained in some cell of $D(Q)$.
(2) The endpoints of e_p lie on P_1 and P_2.
(3) The vertical span of e_p is $\bar{\mu}/(6\delta + 1)$.

If the list items are phrases, you can use either commas or semicolons, depending on whether there is internal punctuation.

The connected graph G is built by
(1) committing all uncommitted edges, as described above;
(2) joining the remaining open entry vertices with some number, Δ, of extra vertices so as to make G have n vertices and be d-regular; and
(3) designating one of these extra vertices as t.

There is much more on lists in Chapter 6.

12.5. Wording

- Stet ***shall, upon, since.***
- Stet author's use of **well-behaved**, **well-defined**, **well-order**, and **well-posed**. (See Appendix D for definitions of these terms with hyphens.)
- Stet **future tense** unless it is grammatically incorrect.
- Use **first person plural**, including in the abstract. Stet **plural personal pronouns** even when there is only one author. The use of ***one*** also is acceptable.
- Try to avoid reference numbers, variables, equation numbers, and mathematical expressions as the **first word in a sentence**.
- When the word "equation" falls midsentence before the equation number, it can be deleted to help with line breaks, but do not delete terms describing the equation, such as "assumption (2.6)", "problem (14)", "inequality (3.3)". Stet "equation" at the beginning of a sentence.
- Stet the word "equation" when it is part of such expressions as "the density equation (3.1)". Also stet "equation" for clarity.

Under the assumption in (1.2), equation (1.1) has monotone traveling wave assumptions.

- Stet the use of either "resp." or "respectively" if usage is consistent within the paper. Insert a comma before or after respectively, or both, depending on the construction (see the section on commas below). Use of "respectively" in text and "resp." in parentheses within a paper is an acceptable construction and is preferred.
- Stet the author's use of "i.e.", "e.g.", "that is", "for example", "vice versa", "cf.", and "etc." These are text dependent. The expressions "i.e.", "e.g.", "that is", "for example", and "etc." are set off with commas.

- Use "For all", not ∀, and "There exists", not ∃, at the beginning of a sentence. These symbols should only appear within a math expression and are best reserved for displayed math. We will stet an author's use in borderline cases, but use caution when introducing any math symbols (see p. 99).

✓

For all sets S_i in P, partition S_i into cliques containing v, S_i'.

✓

A scheme is *independent* if for all its states local satisfaction implies global satisfaction.

ok[a]

Observe that if a solution φ of (1.6) satisfies $\lim_{t\to+\infty} \|\varphi(t)\|_{H^2} = 0$, then by the orbital stability result, $\varphi(t) = 0\ \forall t \in \mathbb{R}$.

✓

There exists $\varepsilon > 0$ such that for any odd $\varphi^{in} \in H^1 \times L^2 \ldots$.

ok[b]

We claim the following coercivity property: $\exists\ \kappa > 0$ such that

$$\langle w, Z_1 \rangle = 0 \Longrightarrow \int \left(\frac{3}{4} w_x^2 - \frac{21}{10} \operatorname{sech}^2 \left(\frac{x}{2} \right) w^2 \right) \geq \kappa \int w_x^2.$$

ok[c]

E has the property that $a \in \mathcal{A}_\mu$ and $G \curvearrowright (\mathbf{B}^G, E(h, a))$ are measurably conjugate $\forall\ h \in \mathcal{H}$.

[a] In this example the ∀ symbol falls within a math expression, its only acceptable location. It would be equally acceptable to spell it out because it falls within in-text math.
[b] In this example the ∃ symbol falls between text and mathematics, and we prefer the use of text here instead of a symbol; however, since the author used the ∃ symbol here, we would let it stand.
[c] In this case, the ∀ symbol is being used instead of text—a lazy shortcut but acceptable.

- Use "section" without abbreviation. Note that the AMS prefers the lowercase form. If, however, the author uses initial caps consistently, we will allow it. Note also that we will allow § instead of "section" if used consistently. See section 3.3 for additional information about handling "section".
- Spell out numbered enunciations in full (e.g., Theorem 6.7, Definition 2.1, Remark 3) since they are proper nouns. Abbreviated forms (e.g., Thm. 6.7, Def. 2.1, Rem. 3) are not allowed except when cited as part of a reference (e.g., [11, Thm. 6.7 and Def. 2.1]).

- In text, spell out "Figure" and "Table" for figure and table callouts, respectively. See Figure 2.1 and Table 3.2.
- Avoid the use of "above" or "below" when referencing numbered figures and tables. Because AMS journals also appear online, we prefer the use of full text references to figures and tables, so they will be linked in the hypertext version of the paper.
- Change the author's use of "the sequel" to "what follows" or similar wording. Be sure, however, that the author is not referring to Part II of a paper in a series, for example, for which the sequel designation is correct.
- Use a comma in *if/then constructions*.

We infer that if φ^{in} is small enough, then $\varphi(t)$ is global in time.
If $x < 0$, then $x = y$.

- In a series of *let/be statements*, make sure each of these statements has both "let" and "be" with the appropriate punctuation. These are independent clauses and should be joined by a comma.

Let K be a triangle (tetrahedron), and let S be any of its edges (faces).
Let ρ be a segment, let g be an elliptic curve, and let h be a domain.

It is permissible to group like items within a let/be statement, but be cautious about punctuation with other independent clauses.

Let I and J be two disjoint sets of indices, and consider the set of all J-coordinates of points in A with given I-coordinates.

In an exception to the CMS guidance on elided text (CMS, 6.49), the AMS allows the following form of let/be statement.

Let A be an abelian group and $h : A \to \mathbf{R}$ a real valued function on A such that the function...

This does not generalize to other situations, and the form above is strict. This is a case of a usage that has been "grandfathered in"—the example given is part of a famous lemma, and parallel examples are common.

- Stet the author's use of "that" and "which". These may be changed only if you are sure you understand the author's meaning and you are sure that meaning will not be changed. (*The Elements of Style* concisely explains "that" versus "which".)

- Set up proper parallelization.

✘ The proof follows easily from Proposition 3.4, Theorems 3.5 and 2.4.
✓ The proof follows easily from Proposition 3.4 and Theorems 3.5 and 2.4.

✘ This type of system is practical, easily implemented, and can be adapted to different problems.
✓ This type of system is practical and easily implemented and can be adapted to different problems.

✘ The impedance Z' depends both on the driving current $\mathbf{I}$ and the actual boundary conditions $\boldsymbol{\psi}_R$ and $\boldsymbol{\psi}_I$.
✓ The impedance Z' depends on both the driving current $\mathbf{I}$ and the actual boundary conditions $\boldsymbol{\psi}_R$ and $\boldsymbol{\psi}_I$.

✘ As a result, in this case the first eigenvalue is genuinely nonlinear and therefore either will admit shock waves or rarefactions.
✓ As a result, in this case the first eigenvalue is genuinely nonlinear and therefore will admit either shock waves or rarefactions.

- The computer language MATLAB is spelled in all caps.

12.6. Acronyms

- Spell out acronyms the first time they are used in the text, followed by the acronym in parentheses.
- An acronym spelled out in the abstract must be spelled out again in the body of the text.
- Use an acronym consistently throughout the paper once it has been introduced.
- Key words may appear as acronyms if the acronym is used throughout the article.
- Plural acronyms are formed with a lowercase "s", no apostrophe; e.g., PDEs.
- Mark the "s" in plural acronyms to be lowercase in titles and running heads.
- 3D, 3-D, 3d, 3-d (for three-dimensional), e.g., are acronyms and should be spelled out on first use.

- Some acronyms are better known than their spelled-out name. In such a case it is possible to reverse the definition so that the acronym appears first and the spelled-out version follows it in parentheses.

. . . the RSA algorithm (the Rivest, Shamir, and Adelman algorithm)

12.7. Punctuation

Mark the paper to conform to AMS style. Maintain the author's style if it is consistent and does not violate specific grammar or AMS style rules. Always be careful not to impose your personal style on the author. Mathematical expressions, including displayed equations, are treated as phrases or sentences and are punctuated accordingly (see section 13.4).

12.7.1. Period.

- Figure and table captions end with a period only when they are a full sentence.
- There is a period after each initial in an abbreviated hyphenated name: Y.-N. Lee or J.-P. Serre.

12.7.2. Comma. Don't overuse the comma. An open style—using commas only when necessary—is preferred (see p. 11). You should retain the author's use of commas whenever possible.

If a comma is not incorrect as placed, leave it alone. For example, short or midsentence phrases such as "thus", "therefore", and "hence" may be followed by a comma or not. If commas are used, or not used, consistently in similar constructions throughout the paper, leave them alone. Your goal is to make the paper consistent.

Consult *The Chicago Manual of Style* for comma usage and guidelines (Chapter 6, sections 6.16–6.53).

12.7.2.1. *When to add a comma.*

- Use the serial comma before "and" or "or" in lists of three or more items. If commas are used within the items themselves, separate the items with semicolons.
- Use commas to set off parenthetical material (see CMS, section 6.24–6.27).

Discretion, they say, is the better part of valor.
In this case, $x^i > 2$, $i = 1, \ldots, N$, and k denotes a constant.

In the latter example, $i = 1, \ldots, N$ is a condition of $x^i > 2$; conditions are treated as parentheticals. See section 13.4.

- Set off "respectively" with commas.

The first- and third-order methods are discussed in sections 2 and 4, respectively.
Using $m = 1$ (resp., $m = .001$) yields 20 (resp., 42) points per subdomain.
$T = 1$ and $1 + n$ are solved, respectively, in problems 2 and 4.

- Use a comma before "where" following an equation; it usually introduces nonrestrictive information.
- Set off "however" at the beginning of or within a sentence when it is used parenthetically. (See sections 12.7.3 and 12.7.4.1 for more instruction on coordinating conjunctions and CMS, sections 5.194, 5.200, 5.201, 6.29, and 6.55.)

However, by an argument similar to the one above, m's behavior is essentially the same.
Such a regular graph exists by Proposition 3.1, however, since dn, $d(n-\Delta)$.

- Use commas after a long introductory clause (see CMS sections 6.35–6.36).

Since the Jacobian of the system is the zero matrix at the origin, the multiplicity must be at least 3 in order for it to be an isolated solution.

- Use a comma to avoid confusion.

It is important to note the different properties of SCLP solutions constructed from solutions to AP(P), and AP(P) solutions constructed from solutions to SCLP.
In general, equilibrium models are reduced to finding consistent prices.
... where μ and ν are positive constants which depend only on m and n, and $\sigma(\mathcal{C}) := \mathcal{C}\{1 + \ln(1 + \mathcal{C})\}^{-1}$.

In the last example, the equation is part of the "where" list; without the comma after "m and n" the equation could be misread as relating to "depend only on".

- Use a comma, not a colon, in the following situations:

The question we now ask is, Are strict and realistic bounds known for the remainder of the terms? [posed question]
Devo asked the musical question, "Are we not men?" [quoted question]

- See section 13.4 for the use of commas in math.

12.7.2.2. *When to delete a comma.*

- Delete a comma between the parts of a compound predicate (two or more verbs that have the same subject); see CMS, section 6.29.

✘ We present our study in several steps, and consider f strongly convex and differentiable.
✓ We will also take advantage of the special structures of these problems and obtain improved computational complexity results whenever possible.

- Delete a comma before a prepositional phrase; see CMS, sections 5.171, 5.175, and 6.35. For example, delete commas before "if", "for", and "with" in the final clause of a sentence or equation.
- Delete a comma before $\forall$ and "for all".
- Delete the commas in "if, and only if,".
- See section 13.4 for the use of commas in math.

12.7.3. Semicolon. A semicolon is a bigger break than a comma but less than either a period or a colon. In scholarly text semicolons are commonplace and helpful; the most frequent uses are listed below. Do not allow semicolon splices![1] Consult *The Chicago Manual of Style* for semicolon usage and guidelines (Chapter 6, sections 6.54–6.58), and for some confusing examples see section 12.7.4.1 on p. 90.

[1] A "splice" is when two independent and "unrelated" clauses are joined by a comma or a semicolon.

- Use a semicolon to separate two independent, *related* clauses that are not linked by a conjunction.

✓ These must be removed because otherwise the random walk becomes biased toward visiting vertices that are connected by many edges; our analysis requires that the random walk be unbiased.

✓ This assumption is required for the approximation results in Sobolev spaces; see, e.g., [5].

- A semicolon is used to separate independent clauses joined with "thus", "hence", "therefore", "then", "however", and "moreover" (coordinating conjunctions, see CMS, sections 5.194, 5.200, 5.201, 6.29 and 6.55).

✓ Let us restrict our discussion to $m = 2$; then we can provide a proof for Theorem 4.2.

- Use a semicolon between items in complex or lengthy lists (e.g., lists whose items contain commas within them).

✓ In the row-major indexing, $P_{i,j}$ has index $i \cdot n + j$; in the column-major indexing, it has index $i + j \cdot n$; and in the reversed row-major indexing, it has index $i \cdot n + (n - j)$.

✓ Furthermore, u will necessarily be even, since each entry vertex starts with $d - d'$ missing half-edges; since $d - d'$ is a multiple of q, hence even; and since each committed edge replaces a pair of missing half-edges.

- Semicolons and commas are not interchangeable.

✘ Clustering is used in various fields of statistical analysis; pattern recognition; learning theory; computer graphics; and combinatorial chemistry.

12.7.4. Colon. A colon indicates that what comes next is directly related to the previous sentence. This ranges from a phrase to an independent clause to a series of statements to a list. The use of capitalization following the colon gives the reader an idea of how much may be coming. Consult *The Chicago Manual of Style* for colon usage and guidelines (Chapter 6, sections 6.59–6.65).

- A colon introduces a series or list. Use a colon only after a complete sentence, particularly if the sentence contains the words "the following" or "as follows".

We plan to visit the following cities: Rome, Venice, and Florence.

The directions read as follows: stay straight for 400 yards, then bear left at the fork.

This paper attempts to do the following:
(1) review some of the known methods for mesh selection,
(2) show their connections and propose some new variants,
(3) introduce a new class of robust mesh-selection methods.

However, if the list or series comes after an expression such as "namely", "for instance", "for example", or "that is", a colon is used *only* if the series consists of grammatically complete clauses. See section 12.7.4.1 for a deeper discussion.

- A colon introduces a part of a sentence or an equation that exemplifies, restates, or explains the preceding part. Generally, the word following the colon begins with a lowercase letter unless it introduces a quotation or a series of more than one sentence; however, stet the author's usage whenever possible.

✓

In computational complexity theory, graph traversal is a fundamental problem for an additional reason: understanding the complexity of directed versus undirected graph traversal seems to be the key to understanding the relationships among deterministic, probabilistic, and nondeterministic space-bounded algorithms.

✘[a]

Hemmerling and others have considered similar models; see Hemmerling's monograph for an extensive bibliography emphasizing results for "labyrinths": graphs embedded in two- or three-dimensional Euclidean space.

✓

The problem we will be considering is "undirected *st*-connectivity": Given an undirected graph G and two distinguished vertices s and t, determine if there is a path from s to t. If so, consider the set of all n-vertex, edge-labeled, undirected graphs $G = (V, E)$ with maximum degree d.

[a] This example would be better if the book being referenced was put in parentheses. The colon can remain.

- Authors often use colons to introduce displayed equations and lists.

✓ The result is given in the following equation:

$$\log(n+1) - 3n = x + 1.$$

✓ As a specific example, we take the logarithmic-quadratic function to inherit the following properties:

(a) z is a strictly convex differentiable function,
(b) $y = r$,
(c) $p > q$ otherwise.

✓ We denote the feasible region for problem (1.1) by Ω:

$$\Omega = \{x \in \mathbf{R}^n | l \leq x \leq u\}.$$

✘ The results can be written as:

$$Ca \geq [0].$$

✘ The volume of a tetrahedron is given by:

$$1/3 \times (\text{area of base}) \times \text{height}.$$

✘ We can also state that:

$$F(i) = I.$$

Note that no punctuation is needed before the displayed equations in any of the three incorrect (✘) examples given.

- Do not insert a colon before the direct object of the verb or before a predicate nominative. (The incorrect equation examples given above illustrate this.)

✘ Members of the department include: the undergraduates, graduate students, and the professors.

- Use periods, not colons, to introduce math items such as theorems and lemmas.

✓ Our results are summarized in the following theorem.

THEOREM 2.1. *Let X be a set ....*

✘ Our results are summarized in:

THEOREM 2.1. *Let X be a set ....*

✘ Our results are summarized in the following theorem:

THEOREM 2.1. *Let X be a set ....*

- Use a capital letter after a colon in titles of sections.

THE SMITH THEOREM: AN OVERVIEW

The rules about complete sentences preceding or following a colon do not apply in these situations. (See section 8.156 of CMS for a discussion on sentence-style capitalization.)

12.7.4.1. *Comma*? *Semicolon*? *Colon*? There is a curious intersection where commas, semicolons, and colons can each be a legitimate option, and it almost always involves a list or series. Here we modify a very useful example from Chapter 6.

In this first iteration, the comma is featured. There is nothing *wrong* with this, but it may be a little distracting since "namely" should have a semicolon preceding it.

It is convenient to split this into three regions, namely, (1) Region A, $n, [n/2]$; (2) Region B, $[n/3]$; (3) Region C, $[n/(3{\cdot}2)], \ldots, [n/(3{\cdot}2^{lb-(i+2)})]$.

It is not uncommon for authors to include a colon after "namely" when introducing a list or series. In the following example—because it introduces a vertical list—it is not strictly wrong, but it is distracting.

It is convenient to split it into three regions, namely:
Region 1. $n, \lceil n/2 \rceil$.
Region 2. $\lceil n/3 \rceil$.
Region 3. $\lceil n/(3 \cdot 2) \rceil, \ldots, \lceil n/(3 \cdot 2^{lb-(i+2)}) \rceil, \ldots$.
In Region 1, b_{i+1} is either n or $\lceil n/2 \rceil$; that is, $i = lb - 1$ or $i = lb - 2$.

In both cases, AMS preference is to use a semicolon (or even an em dash) before "namely" and a comma after it.

ok:

It is convenient to split this into three regions—namely, (1) Region A, $n, [n/2]$; (2) Region B, $[n/3]$; (3) Region C, $[n/(3{\cdot}2)], \ldots, [n/(3{\cdot}2^{lb-(i+2)})]$.

It is convenient to split it into three regions; namely,
Region 1. $n, \lceil n/2 \rceil$.
Region 2. $\lceil n/3 \rceil$.
Region 3. $\lceil n/(3 \cdot 2) \rceil, \ldots, \lceil n/(3 \cdot 2^{lb-(i+2)}) \rceil, \ldots$.
In Region 1, b_{i+1} is either n or $\lceil n/2 \rceil$; that is, $i = lb - 1$ or $i = lb - 2$.

This is in agreement with CMS, sections 6.43, 6.56, 6.85, and also the last sentence of 6.65. And, as always, if an author uses one construction consistently, let it stand.

12.7.5. Hyphen. Hyphens are used in compound words, most commonly compound adjectives. These should be noted on your style sheet. For thorough guidance on this topic, put a sticky label on section 7.85 of your CMS so you can open to it frequently. For hyphenated compound nouns and treatment of specific words, check your dictionary.

- Some compound words always contain hyphens and appear that way in the dictionary.
- For mathematical terms, **follow the author's style for compound words**, using hyphens and spaces or closing up words consistently. Note these on your style sheet. (See Appendix D for more guidance.)
- Hyphenated compounds appear *before* the noun they modify.

second-order differential operators *or* differential operators of second order
an ill-posed question *or* the question was ill posed

- A hyphen, not an en dash, is used in pairs of words indicating opposition.

even-odd system
an apples-oranges kind of choice
a zero-nonzero pattern of solutions

Other style guides (e.g., American Psychological Association) indicate that words in opposition take an en dash, but the AMS does not endorse that form.

Here's an interesting situation:

The idea is to construct sub- (super-) solutions using the maximum principle.

Stet this construction, although throughout the paper these words are not hyphenated.

12.7.5.1. *When to hyphenate suffixes and prefixes.* Refer to *The Chicago Manual of Style* for exceptions (CMS, 7.85).

- Hyphenate words formed with the suffix "-type".

a Newton-type method, a Cauchy–Schwarz-type equation

- Hyphenate words formed with prefixes before a proper noun.

non-Hermitian

12.7.5.2. *When to hyphenate compounds, participles, etc.*

- Hyphenate adjective plus past participle constructions.

nimble-minded mathematician, well-known study

- Hyphenate noun plus present participle constructions.

decision-making methods

- Hyphenate adjectival compounds.

lower-level toxin

- Hyphenate compounds of degree.

very-low-degree polynomial

12.7.5.3. *When not to hyphenate.*

- Do not hyphenate words formed with the prefixes “ante-”, “anti-”, “bi-”, “counter-”, “de-”, “equi-”, “extra-”, “infra-”, “inter-”, “intra-”, “macro-”, “micro-”, “mid-”, “mini-”, “multi-”, “non-”, “over-”, “pre-”, “post-”, “pro-”, “pseudo-”, “re-”, “semi-”, “sub-”, “super”, “supra-”, “trans-”, “tri-”, “ultra-”, “un-”, “under-”.
- *Exception*: Hyphenate any prefix joined to a word beginning with the same ending vowel as the prefix; e.g., semi-independent, bi-invariate..
- Do not hyphenate words formed with the suffixes “-fold”, “-hood”, “-less”, “-wise”.
- Do not hyphenate words commonly read together as a unit.

ice cream cone

- Do not hyphenate after adverbs ending in “-ly” even when used in a compound modifier.

highly specialized field

- Do not hyphenate “ill” and “well” compounds that are themselves modified.

very ill conditioned matrix

- Do not hyphenate “th” expressions: xth, not x-th or x^{th}.

12.7.6. En dash. An en dash is the width of the letter "N". It most frequently expresses a range, but it has a number of other uses detailed below. Consult *The Chicago Manual of Style* for en dash usage and guidelines (Chapter 6, sections 6.78–6.81).

- The en dash (–) is most commonly used to express a range of numbers.

equations (2.2)–(2.6)
pp. 345–348

  Don't change an en dash to the words "to" or "through". Change a hyphen in a range to an en dash.

- Use an en dash between two author names joined in an adjectival construction. (Note that this treatment is more intuitive when one author has a hyphenated name.)

the Smith–Jones formula
the Birch–Swinnerton-Dyer conjecture

- Use an en dash to form a compound modifier if one of the elements is hyphenated or consists of more than one word.

mathematician–physicist-directed planning
post–Civil War period

- Use a hyphen, not an en dash, in pairs of words indicating opposition.

even-odd system
an apples-oranges kind of choice
a zero-nonzero pattern of solutions

  Other style guides (e.g., American Psychological Association) indicate that words in opposition take an en dash, but the AMS does not endorse that form.

12.7.7. Em dash. The em dash is the width of the letter "M". It is the most versatile of the three dashes, functioning as comma, parentheses, or a colon. While in the past it was considered too informal for scholarly text, it is now in common usage. Consult *The Chicago Manual of Style* for em dash usage and guidelines (Chapter 6, sections 6.82–6.89).

- Use an em dash (—) to set off material for emphasis. In the following example either a comma or colon would have worked, but each one has a different level of separation.

The probability that we have found such a configuration is $P_{0.5}(1000) \approx 1 - e^{-5} = 0.99326$—a virtual certainty.

- Parenthetical elements can be set off by em dashes. For less emphasis use parentheses.

This triumvirate—baseball, hot dogs, apple pie—defined America for much of the 20th century.

12.7.8. Apostrophe. Aside from its traditional uses of forming possessives and indicating contractions, the apostrophe is used in mathematics to form the plural of a single character variable. Consult *The Chicago Manual of Style* for usage and guidelines for the apostrophe (Chapter 6, sections 6.113–6.115, and other sections noted therein).

- Variables and arabic numbers are made plural by adding an apostrophe and the letter "s".

a's, b's, c's; α's, β's, γ's, 1's, 2's, 3's, etc.

- Plurals of acronyms do not contain apostrophes; for example, write PDEs, not PDE's.
- The AMS prefers to avoid the use of contractions.
- When making a possessive from a name ending in "s", add an apostrophe and "s". This is an evolution of former guidance from the CMS.

Gauss's ideas, Descartes's dreams, Eratosthenes's sieve, Wiles's solution

12.7.9. Quotation marks. Quotation marks are used both for quotations and for emphasis.

- Use double quotation marks around direct quotes and to set off original or unusual words (which are called "scare quotes"). Do not use quotation marks around words or phrases that follow the expression "so-called".

A maximum partition matching can be constructed from a simpler "prematching" on the elements in U. If the number of subsets in the collection $\mathcal{S}$ is small, we develop a greedy algorithm that uses a "chain justification" technique.

- Single quotation marks are used *only* within double quototation marks.

> "His exact words were, 'I'll be there at noon'," said Elisa.

- The AMS uses a logical style for commas and periods, meaning they fall *outside* quotation marks. This is a break with most other styles. Colons and semicolons, however, still fall outside quotes. Question marks and exclamation points go inside quotes only when part of the quoted material.

> Einstein conceded that his proof failed in the special case treated by Levi-Civita and offered to "include the corrections I have learned from our memorable correspondence".
>
> Poincaré asked, "Can we state mechanical facts by relating them to a non-Euclidean space?"

The AMS prefers italics over scare quotes, but some authors seem to want multiple levels of emphasis. Our guidance is to use italics for a word that will be defined and to use scare quotes for words being used in an unusual way. This is a moment for flexibility, however, and consistency within a paper is what matters most. Note your choices on the style sheet if there is any deviation.

12.8. Quotations

Direct quotations of five or more lines should be block indented. Ask the compositor to use the `quote` LaTeX environment, which indents the quoted material about 3 picas on either side. Consult CMS, Chapter 13, for additional guidance as needed.

12.9. Gender-neutral and bias-free language

The AMS prefers to avoid the use of gender-specific terms whenever possible. Luckily, "mathematician" is in the clear! Here are a few pointers. The use of they/their is *not* an acceptable substitute for he/him or she/her. Some authors prefer to use she/her everywhere, while others prefer to alternate between he/his and she/her. It is also possible to use "he or she" or "his or her" when such use is limited—it becomes unwieldy when used repeatedly. For deeper and more varied guidance, please see CMS, sections 5.221–5.230, and especially 5.225.

12.10. Miscellaneous applications

There are a number of consistent problems when editing ESL works. Chief among them are problems in using articles. Keep in mind that articles are adjectives, and they describe the noun they modify. In the following examples, the meaning of an article is intuitively clear to native speakers, but they pose outsize problems in ESL works:

- The combinatorial interpretation of Muchnik's theorem...
  (The one and only)
- A combinatorial interpretation of Muchnik's theorem...
  (One of many)
- Combinatorial interpretation of Muchnik's theorem...
  (A discussion of how it's done)

Within mathematical text the misuse of an article can alter the meaning of a sentence. Therefore, these are not simple edits. If you have any suspicion that there may be shades of meaning, query the author.

Not infrequently the copy editor will have to make decisions about whether to use "a" or "an". If the article appears before a word beginning with a consonant sound, use "a"—a univalent thingie. If the word requiring the article begins with a vowel sound, use "an"—an honorary degree, an n-dimensional doodad, an ω-level widget. But the AMS does prefer words beginning with a pronounced "h" be preceded by "a"—a historical remark.

While "mathematics" and "asymptotics" always have an "s" at the end, other similar terms do not: "statistics" is different from "statistic"; "arithmetic" and "arithmetics" are both used. If you cannot be certain which is correct, query the author.

"The number is..." but "a number are...".

Chapter 13

Editing Mathematics

The rules of good grammar and correct punctuation also apply when editing mathematics. However, mathematics should be edited as lightly as possible to ensure the author's meaning or the mathematics isn't changed. What may seem like an insignificant editorial change may in fact change the mathematical sense of a statement.

The copy editor should make sure that the notation is consistent, that fences match, that linebreaks within mathematical expressions are correct, and that other rules in this chapter are followed. Keep in mind that the AMS uses LaTeX to typeset all journal articles, so spacing around mathematical elements is automated and generally should not need to be changed.

13.1. Numbers

- Generally, spell out single-digit numbers and use digits for 10 and above when they appear in the text. However, for numbers less than 10, note the author's use of numerals and spelled-out numbers for any patterns and mark these on the style sheet. For instance, some common phrases that include an acceptable use of single-digit numbers are "rank 1" or "rank one", "codimension 2" or "codimension two", "3-dimensional" or "three-dimensional". The use of single digits is acceptable if used consistently.

  In most cases, you should stet the author's use of a numeral or a spelled-out number.

- Numerals, including roman numerals (I, IV, XII), are always set roman no matter what the surrounding text font environment is. For instance, in italic text:

Correct: *For any integers* $k > 1, 2, \ldots,$ *and any* $n \geq 1, 2, \ldots,$ *there exists a minimal positive integer.*

Correct: *Assume that* F *is uniformly convex of Type* I.

13.2. Variables

- Math variables are generally italic (f) but may appear as bold roman ($\mathbf{f}$), bold italic ($\boldsymbol{f}$), roman (f), German (fraktur) ($\mathfrak{f}$), calligraphic ($\mathcal{F}$), or blackboard bold ($\mathbb{F}$). Stet the author's usage, but change fake or "poor man's" blackboard bold to true blackboard bold, such as $\mathbb{IP}$ to $\mathbb{P}$; see Appendix E.

  Roman and italic variables:
  $$\mathrm{E}[d^{(j)}(w, R, x \odot Y, Y) - e^{(j)}(w, R, Y)] = \delta_0^{(j)}(w).$$

  Bold and italic variables:
  $$\textstyle\sum_{j \in \{0,\ldots,k_n-1\}} c_j \geq k_n \mathbf{p}_n - k_n^{2/3} = m_n + {k_n}^{2/3}.$$

  Bold, italic, roman, and calligraphic variables:
  $$\mathbf{L_1}(\mathcal{D}, \mathcal{E}) = \textstyle\sum_{x \in S} \left|\Pr[\mathcal{D}(x)] - \Pr[\mathcal{E}(x)]\right| / 2.$$

13.3. Standard abbreviated forms of mathematical expressions ($\inf, \max, \min$, etc.) and functions ($\sin, \cos, \tan$, etc.)

- See Appendix A for a comprehensive, though not exhaustive, list of functions and expressions that are ordinarily set in roman type—in both roman and italic text.
- Mathematical expressions and functions are set as roman rather than italic characters so that they will not be confused with mathematical variables.

Correct: THEOREM 8.5. *Assume that the sequence* $\{\rho_k\}$ *is bounded and* $\lim_{k\to\infty}|C_k| = 0$.

Incorrect: THEOREM 8.5. *Assume that the sequence* $\{\rho_k\}$ *is bounded and* $lim_{k\to\infty}|C_k| = 0$.

- Mark functions and expressions to be roman if set in italics and list on the style sheet.

- Some expressions can begin with capital or lowercase letters. For instance, ker and Ker can stand for two different types of kernel, so the author's use should be kept.
- Expressions and functions are followed by a thin space unless followed by an argument enclosed in fences, in which case the space is closed up.

$\dim e^{3,0}, \qquad \max\langle\theta, p\rangle, \qquad \mathrm{Aut}_C(V)$

- Author-created functions (those not included in Appendix A) may be italic. Treat them consistently.

Acceptable: Assume that $(u_1, v_1) \in Ef$, $(u_2, v_2) \in Eb$, and $lev(u_1) = lev(u_2)$.

(Here *lev* is an author-created function.)

- Stet italic superscript and subscript functions if used consistently.

Acceptable: If a crossing is forced, then there exist y on $P(wx_{min})$ and a node $z \in T_y$ with $\dim(z) = \dim(wx_{max})$.

- Subscripts are placed alongside, not beneath, functions in text.

Correct: $\max_{\hat{P}\in C^{N-k+2}} \min_{\tilde{P}\in C^k} \rho(\tilde{P}\hat{P}) = \lambda_k$.

- $\forall$ (which means "for all") and $\exists$ (which means "there exists") are logical symbols which should generally not appear in text unless in a mathematical expression. In text use "for all" and "there exists".

Correct: There exists an n-dimensional compact complex manifold X with $c_1(X) \geq 0$.
Incorrect: $\exists$ an n-dimensional compact complex manifold X with $c_1(X) \geq 0$.
Correct: For all integers $k \geq 0$ we know that $H^k(X) \in \mathcal{T}_n$.
Correct: We know that $H^k(X) \in \mathcal{T}_n$ $\forall k \geq 0$.
Incorrect: $\forall$ integers $k \geq 0$ we know that $H^k(X) \in \mathcal{T}_n$.

- Stet spacing around $\forall$ and $\exists$.

Preferred: A semirandom source with parameter α outputs bits $X_1X_2,\ldots,X_R$ such that $\forall x_1,\ldots,x_i \in z$, α holds.

Acceptable: If $\mathbf{X} = (X_1,\ldots,X_n)$ is sampled uniformly at random from S, then $\forall\ b_1,b_2,\ldots,b_3 \in \{0,1\}$ the following holds.

13.4. Punctuation

- Each mathematics equation reads as a clause or sentence and is punctuated accordingly. Authors, however, sometimes leave displayed math unpunctuated. Insert commas and periods as needed so that the equation(s), the preceding text, and the following text together read grammatically. **Follow CMS, sections 12.18–12.20, for punctuating mathematical expressions and elided lists, operators, and relations.**

- Set off conditions with commas. A condition is a phrase that restricts an item within an equation.

Correct:

$$z_k = \Phi^{-1}(e^{i\theta_k}), \qquad k = 1,\ldots,n+1,$$

Correct: Since L^{-1} is triangular, the computation of $L^{-i}A$, $i = 1,\ldots,m$, takes $mn^3 + O(\max\{m,n\}^3)$ flops.

- Delete commas appearing before $\forall$ or "for all". However, ...
- ... stet commas enclosing a parenthetical "for all" phrase that precedes the relevant equation.

Correct: Then (4.2) shows that, for all $x < 0$, the restriction would be $T_0 \le T_1$.

- Do not use a comma before verbal expressions after math, such as *if*, *when*, *for*, *such that*. Do use a comma before *where*, however, because it usually begins a nonrestrictive phrase.

Incorrect: $f = 2(x)$, if $x < 1$

Incorrect: ... $a_i = a_j + a_k$ for some $k \le j < i$, such that for every $i \ge 1$, ...

- If consistent, stet the author's use of commas in numbers of four digits or more: 1000 or 1,000, 23000 or 23,000. Ensure that usage within tables is consistent with the text.
- Don't add a comma after every displayed equation that does not end with a period. Consider the surrounding text. Recall that a comma never precedes *for all,* $\forall$, or a preposition.
- Two displayed equations separated by the word "and" may form a compound predicate, so do not add a comma before the "and".

Proof of Corollary 1.5. We have seen from the proof of Corollary 6.7 that there exists $r > 0$ such that for $Q_j \cap B(z, r) \neq \emptyset$,

$$g(A_{\mathrm{dist}(z,Q_j)}(z)) = G_D(A_{\mathrm{dist}(z,Q_j)}(z), x_0) \asymp \Phi(\mathrm{dist}(z, Q_j))^{1/2}$$

and

$$g(x_j) = G_D(x_j, x_0) \asymp \Phi(\mathrm{dist}(Q_j, \partial D))^{1/2}.$$

- Use a serial comma with three or more displayed equations.
- Do not use a comma before prepositions within equations.

Correct:

$$E := \left\{x \in X : \limsup_{t \searrow 0} \frac{\|f(x + tu) - f(x)\|}{t} < \infty \text{ for every } u \in X\right\}$$

Correct: If f is Gâteaux differentiable at $y \in H$, then $Df(y, u) = \tilde{D}f(y, u)$ for every $u \in Y$.

- Punctuate each line of a left-braced multiline equation. Do not punctuate lines within a right-braced equation, but stet if the author did so.

Correct:

$$\begin{cases} \overline{D}f(y, u + v) \leq \tilde{D}f(y, u), \\ \overline{D}f(y, v) = f'(y, u) + \overline{D}f(y, v), \\ \tilde{D}f(y, u + v) \geq -\overline{D}(-f)(y, u), \\ \tilde{D}f(y, v) = f'(y, u) - \overline{D}f(y, v), \end{cases}$$

Correct:

$$\left.\begin{array}{l} \overline{D}f(y, u + v) \leq \tilde{D}f(y, u) \\ \overline{D}f(y, v) = f'(y, u) + \overline{D}f(y, v) \\ \tilde{D}f(y, u + v) \geq -\overline{D}(-f)(y, u) \\ \tilde{D}f(y, v) = f'(y, u) - \overline{D}f(y, v) \end{array}\right\}$$

- Don't introduce a displayed equation with a colon if the introductory sentence continues after the equation. It's okay to use a colon if the equation is followed immediately by a "where" list or other qualifiers or conditions directly related to the equation.

Correct: Treating the problem naively, the equations of motion become

$$m\frac{dv}{dt} \in mg\sin\theta - mg\cos\theta\,\mathrm{Sgn}\,v \begin{cases} \mu_{dynamic} & \text{if } v \neq 0, \\ \mu_{static} & \text{if } v = 0, \end{cases}$$

and the right-hand side contains the right-hand side for the original friction model (1.1).

Correct: Part of these computations involve forming the differential measure of the energy:

$$d\left(\frac{1}{2}v^T M(q)v + V(q)\right) = \frac{1}{2}(v^+ + v^-)M(q)\,dv + \frac{1}{2}v^T\left(\frac{d}{dt}M(q)\right)v\,dt,$$

where the first term comes from a result of Moreau.

Incorrect: This gives differential equations and inclusions:

$$\begin{aligned} \frac{dq}{dt} &= \frac{1}{m}p, \\ \frac{dp}{dt} &\in -\partial\psi(q) - g, \end{aligned}$$

but note that $\partial\psi(q) = \{0\}$ if $q > 0$, $\partial\psi(q) = \mathbb{R}_+$ if $q = 0$, and $\partial\psi(q) = \emptyset$ if $q < 0$.

Correct: This gives differential equations and inclusions:

$$\begin{aligned} \frac{dq}{dt} &= \frac{1}{m}p, \\ \frac{dp}{dt} &\in -\partial\psi(q) - g. \end{aligned}$$

Note, however, that $\partial\psi(q) = \{0\}$ if $q > 0$, $\partial\psi(q) = \mathbb{R}_+$ if $q = 0$, and $\partial\psi(q) = \emptyset$ if $q < 0$.

13.5. Line dots (ldots) and centered dots (cdots)

To mark these edits, the copy editor should circle the incorrect dot form and write either "ldots" or "cdots", as appropriate, in the right margin.

- Line dots (ldots) are used between variables with other punctuation.

$$0, \ldots, n-1.$$

- Centered dots (cdots) are used between operators and relations.

$$0 < \cdots < 2, \qquad x_1 + x_2 + \cdots + x_n.$$

Exception: $a_1 \cdot a_2 \cdot \ldots \cdot a_n$ is the preferred form here for readability.

- Stet the location of dots if there are no commas or operators.

$$\pi(1, i)(u) = (a_1^{(1)} \cdots a_{j-1}^{(1)}).$$

- Change ellipses (...) to ldots.

13.6. Fences

- Several types of fences are used in mathematics. The most common are the following:

Parentheses ( )	Brackets [ ]	Braces { }
Angle brackets $\langle\ \rangle$	Single bars | |	Double bars $\|\|\ \|\|$

- Change the incorrect use of less than and greater than symbols ($<$ and $>$) when angle brackets ($\langle\ \rangle$) are meant.

$$\langle f \circ g \rangle'(t) = f(g(t))(g'(t)) \quad \text{not} \quad < f \circ g >' (t) = f(g(t))(g'(t))$$

- Fences are usually used in pairs but occasionally are used in combinations such as the following:

$$(a, b] \qquad [a, b) \qquad [a, b[$$

Stet this usage.

- Fences must occur in pairs. When editing, count the fences to make sure that every opening fence has a closing fence. If one is missing, add it (if it is obvious where it goes) or query the author.

Note that a single vertical bar may appear in constructs such as

$$X = \{x_i \in N |\, i = 1, \ldots, n\}.$$

In this case, the vertical bar denotes "such that" and should not be confused with absolute value notation (e.g., $|\alpha|$). Stet the author's usage in this case.

- Fences in math are always set roman.
- Avoid breaking math in text between fences. See section 13.16.
- Fences should preferably be normal size in text, even though fractions, subscripts, or superscripts may extend past them in displays.

- Fences should preferably be as large as the material they enclose in displays.

Preferred:

$$\frac{B_n \log B_n}{\log T'(n)} = o\left(\beta_n \cdot \frac{\log\log T'(n)}{\log T'(n)}\right) = o(1).$$

Acceptable if consistent:

$$\frac{B_n \log B_n}{\log T'(n)} = o(\beta_n \cdot \frac{\log\log T'(n)}{\log T'(n)}) = o(1).$$

- Do not increase fences to encompass superscripts and subscripts, but stet if the author did so.

Acceptable:

$$k_n c_n - \mathbf{H}(f'^{k_n}(\mathcal{X}'), b^{k_n}(\mathcal{X}', Y'))$$

Acceptable:

$$k_n c_n - \mathbf{H}\Big(f'^{k_n}(\mathcal{X}'), b^{k_n}(\mathcal{X}', Y')\Big)$$

Acceptable:

$$\mathrm{E}\Big[\sum_{j\in\{0,\ldots,k_n-1\}} \epsilon^{(j)}\Big] \geq 2\rho k_n = \delta_n/8$$

Acceptable:

$$\mathrm{E}\left[\sum_{j\in\{0,\ldots,k_n-1\}} \epsilon^{(j)}\right] \geq 2\rho k_n = \delta_n/8$$

- For expressions within multiline displays, be sure opening and closing fences that are on different lines are the same size (see p. 119).

13.7. Sums ($\sum$) and products ($\prod$)

These are usually designated by a 14-point symbol in text and a larger size (usually 20-point) in display.

- In text, set subscripts and superscripts to the right of the symbol, while in display set them above and below the symbol.

IN TEXT: $\sum_{a=1}^{\infty}$ $\prod_{a=1}^{\infty}$ IN DISPLAY: $\displaystyle\sum_{a=1}^{\infty}$ $\displaystyle\prod_{a=1}^{\infty}$

TABLE 1. Symbols that are similar in appearance but that have different meanings

Symbol	Symbol	Definition
Σ	$\sum$	cap Sigma and summation
Π	$\prod$	cap Pi and product
$\cup$	$\bigcup$	union: small (conjunction) and big (noun)
$\cap$	$\bigcap$	intersection: small (conjunction) and big (noun)
ϕ	Φ	lowercase phi and capital Phi
ϕ	$\emptyset$, $\varnothing$	lowercase phi and empty set
ϵ, ε	$\in$	lowercase epsilon and member sign
$\langle$, $\rangle$	$<$, $>$	angle brackets and less than, greater than signs
$'$	’	prime and apostrophe
l	ℓ	lowercase ital “el” and lowercase script “el”
x	$\times$	lowercase “ex” and times sign
a	α	lowercase ital “a” and lowercase Greek alpha
d	δ	lowercase ital “d” and lowercase Greek delta
p	ρ	lowercase ital “p” and lowercase Greek rho
v	ν	lowercase ital “vee” and lowercase Greek nu
w	ω	lowercase ital “w” and lowercase Greek omega

- Stet expressions such as
$$\sum_{i=1}^{N}{}', $$
where the prime has a specific meaning and should not be moved.
- Stet small summations or products in the numerators and denominators of stacked fractions (be consistent within the equation).
$$D_i(x) = \frac{\alpha^i_{r_i(x)}}{\sum_y \alpha^i_{r_i(y)}}$$
- Know the difference between capital Sigma “Σ” and summation “$\sum$” or capital Pi “Π” and product “$\prod$”, and mark for corrections if wrong. Query the author if you are unsure. (Also, see Table 1.)

13.8. Unions ($\cup$, $\bigcup$) and intersections ($\cap$, $\bigcap$)

These are usually designated by a 10-point (small) or 14-point (big) symbol in text and a larger size (usually 10-point for small and 20-point for big) in display. (The same general rules here apply for small $\wedge$, $\vee$, $\otimes$, and $\oplus$ and for big $\bigwedge$, $\bigvee$, $\bigotimes$, and $\bigoplus$.)

- Unions and intersections have "small" (conjunction) and "big" (noun) sizes in text and displays. Placement of subscripts and superscripts is treated similarly to sums and products.

  "small" (conjunction) in text: $f_1 \cup f_2 \cup f_3 \cup \cdots \quad f_1 \cap f_2 \cap f_3 \cap \cdots$

  "small" (conjunction) in display: $f_1 \cup f_2 \cup f_3 \cup \cdots \quad f_1 \cap f_2 \cap f_3 \cap \cdots$

  "big" (noun) in text: $\bigcup_{n=1}^{\infty} f_n \quad \bigcap_{n=1}^{\infty} f_n$

  "big" (noun) in display: $\displaystyle\bigcup_{n=1}^{\infty} f_n \quad \bigcap_{n=1}^{\infty} f_n$

- Mark sizing of union and intersection symbols if incorrect. "Big" union and intersection symbols denote the union or intersection of several or infinitely many sets.

Examples of small symbols (conjunctions); same size in text and display:

$$\beta_{g^{-1}}(\mathcal{A}') \cap \beta_{g^{-2}}(\mathcal{A}') \cap \cdots \cap \beta_{g^{-n}}(\mathcal{A}') = \beta_G(\mathcal{A}'),$$

$$x \otimes_A Ae : \operatorname{Tails} A \to \operatorname{Tails} eAe : x \otimes_{eAe} eA$$

In the second example above, the small "otimes" symbol ($\otimes$) carries a subscript, which is more typical of the large noun form ($\bigotimes$). However, in this example, it is a conjunction—notice how it falls between "x" and "Ae". The subscript is NOT diagnostic of noun or conjunction forms! Its position between two variables is how the copyeditor identifies it as a conjunction (or, in mathematical language, a binary operator).

Examples of big symbols (nouns) in text:

$$\textstyle\bigcap_{g\in I} \mathcal{D}'_g \subseteq \mathcal{A}'(\bigcap_{g\in I} \mathcal{D}'_g),$$

$$\mathcal{C} := \mathcal{A}^e \rtimes_{\alpha^e} G = \textstyle\bigoplus_{g\in G} \mathcal{C}_g$$

Examples of big symbols (nouns) in display:

$$\displaystyle\bigcap_{g\in I} \mathcal{D}'_g \subseteq \mathcal{A}'\Big(\bigcap_{g\in I} \mathcal{D}'_g\Big),$$

$$\mathcal{C} := \mathcal{A}^e \rtimes_{\alpha^e} G = \bigoplus_{g\in G} \mathcal{C}_g$$

13.9. Integrals

These are usually designated by a 14-point symbol in text and a larger size (usually 26-point) in display.

- In text, set subscripts and superscripts to the right of the integral symbol: $\nu(\phi_0) - \nu(\phi_T) = \int_0^T \mathcal{C}(\phi_t)dt$.
  In displays, the subscripts and superscripts may be set to the right of the symbol or may be centered above and below them. Stet the author's usage.

$$\int_a^b \quad \int_A \quad \iint_A \quad \iint_A \quad \iiint_A \quad \iiint_A \quad \iint_{-\infty}^{\infty} \quad \iiint_{-\infty}^{\infty} \quad \int_0^1 \int_0^1 \quad \int_A \int_A$$

- Stet small integrals in the numerators and denominators of stacked fractions (be consistent within the equation).

$$D_i(x) = \frac{\alpha^i_{r_i(x)}}{\int_y \alpha^i_{r_i(y)}}$$

13.10. Fractions

- Do not alter or break fractions. If a large fraction overruns the margin in a display, query the author for the proper fix; if it overruns the margin in text, move it to the following line or display the full expression.
- Fractions in text may be case (stacked) or slashed.

  Case fraction: Let A_i be the depth of X_i in the N-tree so that $\frac{1}{n}\sum_{i=1}^{n} A_i$ is the average successful search time.

  Slashed fraction: Let A_i be the depth of X_i in the N-tree so that $(1/n)\sum_{i=1}^{n} A_i$ is the average successful search time.

- Stet case fractions in superscripts and subscripts if leading is not excessive.

Acceptable: Koch showed that if each packet independently chooses a random destination, then the expected number of packets that get through is $\Theta(N/\log^{\frac{1}{q}} N)$. However, permutations may arise.

- Fractions need not be consistent (either case or slashed) throughout a paper, just within a math phrase.
- In slashed fractions, stet parentheses or lack of parentheses—$1/2a + b$ or $1/2(a + b)$—unless the same construction is inconsistent within the paper, in which case query the author.

- Mark fractions set as display style within text to be text style.

Correct (text style):
Furthermore, $f^*(t) = \frac{b-\lambda_1 sP}{b}$. Consequently, $1 = f^* \leq \frac{b-\lambda_1 sP}{b}$.

Incorrect (display style):
Furthermore, $f^*(t) = \dfrac{b-\lambda_1 sP}{b}$. Consequently, $1 = f^* \leq \dfrac{b-\lambda_1 sP}{b}$.

Correct (text style):
... must occur, where $g = \lceil \frac{d+(q-2b)f-(b-1)k-(b-1)\log N}{b} \rceil$. First, ...

Incorrect (display style):
... must occur, where $g = \lceil \dfrac{d+(q-2b)f-(b-1)k-(b-1)\log N}{b} \rceil$.
First, ...

- Stet stacked or case fractions within displayed equations. Fractions do not need to be treated consistently throughout the paper.

  Stacked fractions:

$$\sum_{s=1}^{\infty} \frac{1}{3}\left(\frac{2}{3}\right)^{s-1} sn \leq 4n$$

  Case fraction:

$$\mathrm{pr}(E_v) > \tfrac{1}{3}\log^6 \Delta$$

- Slashed fractions should not be changed.

  Slashed fractions:

$$L((2i-1)\pi/n),\ L((2j-1)\pi/n),\ L((2k-1)\pi/n),$$
$$\mathrm{E}\{L\} = (n-1)\mathrm{P}\{B(n-1, 1/(n-1)) = 2\}$$

- Stet case and slashed fractions in superscripts and subscripts in displayed math. They need not be the same style as the full-size fractions but should be styled consistently within the same display.

  Case fractions:

$$X(z) = \frac{1}{2\pi i}\int_{-\frac{3}{2}-i\infty}^{-\frac{3}{2}+i\infty}$$

  Slashed fractions:

$$c_j \geq k_n \mathrm{p}_n - k_n^{2/3} = m_n + k_n^{2/3},$$
$$SP \not\subseteq RC[N^{1/4}/b, 2^{N^{1/4}/b}]$$

- Stet small integrals and summations in the numerators and denominators of stacked fractions.

$$v_0, \ldots, v_k = v_0 \text{ of } \frac{\sum_{i=1}^{k} C_{v_{i-1},v_i}}{\sum_{i=1}^{k} C_{v_i,v_{i-1}}}$$

- Stet case fractions in the numerators and denominators of stacked fractions.

$$h = \frac{1}{\frac{1}{a} + \frac{1}{b}} = \frac{ab}{a+b}$$

13.11. Cases

- Lines within the cases environment should be separated by a comma (or semicolon if used consistently) and end with a comma or period, depending on the following text.

$$|a| = \begin{cases} a, & a \geq 0, \\ -a, & a < 0. \end{cases} \qquad \text{OR} \qquad |a| = \begin{cases} a, & a \geq 0; \\ -a, & a < 0. \end{cases}$$

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0, \\ 0 & \text{otherwise,} \end{cases} \qquad \text{OR} \qquad f(x) = \begin{cases} 1 & \text{if } x \geq 0; \\ 0 & \text{otherwise,} \end{cases}$$

in some neighborhood...

- Add commas before conditions unless the condition begins with text, as in the second pair of examples above. Stet commas before conditions beginning with text if author's use is consistent.
- Cases should appear as displays. If there are line overruns within a displayed case environment, such as

$$B^{RR}(x;\, u_1, [a_0, b_0], u_2) = \begin{cases} e^{u/\epsilon} D(a(\ell)) e^{-a(\ell)/\epsilon} + \int_u^{a(\ell)} f'''(t) e^{-t/\epsilon} dt, & x \in \Omega_R(u_1, a_0), \\ e^{-u/\epsilon} D(b(\ell)) e^{b(\ell)/\epsilon} + \int_{b(\ell)}^{u} f'''(t) e^{t/\epsilon} dt, & x \in \Omega_R(b_0, u_2), \end{cases}$$

  then the condition may be set on a separate line or the preceding expression can be broken:

$$B^{RR}(x;\, u_1, [a_0, b_0], u_2) = \begin{cases} e^{u/\epsilon} D(a(\ell)) e^{-a(\ell)/\epsilon} + \int_u^{a(\ell)} f'''(t) e^{-t/\epsilon} dt, \\ \qquad\qquad\qquad\qquad x \in \Omega_R(u_1, a_0), \\ e^{-u/\epsilon} D(b(\ell)) e^{b(\ell)/\epsilon} + \int_{b(\ell)}^{u} f'''(t) e^{t/\epsilon} dt, \\ \qquad\qquad\qquad\qquad x \in \Omega_R(b_0, u_2), \end{cases}$$

or

$$B^{RR}(x;\, u_1, [a_0, b_0], u_2) = \begin{cases} e^{u/\epsilon} D(a(\ell)) e^{-a(\ell)/\epsilon} \\ \qquad + \int_u^{a(\ell)} f'''(t) e^{-t/\epsilon} dt, & x \in \Omega_R(u_1, a_0), \\ e^{-u/\epsilon} D(b(\ell)) e^{b(\ell)/\epsilon} \\ \qquad + \int_{b(\ell)}^{u} f'''(t) e^{t/\epsilon} dt, & x \in \Omega_R(b_0, u_2), \end{cases}$$

- The space before the condition is set automatically and should not generally be changed.

13.12. Matrices

- Stet two-row matrices, with or without superscripts and subscripts, in text. Display matrices of more than two rows.

Two-row matrices:
Using the inequality $\binom{x}{y} \le (ex/y)^y$ to bound $\binom{L+g}{g}$ and $\binom{g+k}{g}$, and using $\binom{x}{y} \le x^y/y!$ to bound $\binom{2^{d_i}}{b}$, the product is at most ...

Three-row matrix:
Another possibility is $\left(\begin{smallmatrix} x1 & x1 \\ x21 & x22 \\ x31 & x32 \end{smallmatrix}\right)$, as shown in [14].

The three-row matrix should be marked to be displayed.

$$\begin{pmatrix} x1 & x1 \\ x21 & x22 \\ x31 & x32 \end{pmatrix}$$

- Do not increase the size of fences in text to fully enclose a matrix; doing so may cause excessive linespread. Mark large fences around in-text matrices to be text style.

Correct: The determinant of M is an antisymmetric polynomial of degree $\binom{d+1}{2} + 1$ in the variables x_i, and it is divisible by $(x_i - x_j)$ for all $i < j$.

Incorrect: The determinant of M is an antisymmetric polynomial of degree $\left(\begin{smallmatrix} d+1 \\ 2 \end{smallmatrix}\right) + 1$ in the variables x_i, and it is divisible by $(x_i - x_j)$ for all $i < j$.

- Matrices should never be broken. If a displayed matrix runs over the margin, mark to reduce the point size to fit the margin. The compositor will determine which of several LaTeX options to use.

13.13. Diagrams

- Unlike displayed equations, it is acceptable to omit punctuation from diagrams. Add a colon to the preceding text if the diagram is unpunctuated and ends a sentence.

Acceptable: All these groups are affine algebraic and are related to each other via the following commutative diagram:

$$\begin{array}{ccccccc} 1 & \longrightarrow & H & \longrightarrow & \mathrm{Aut}_H(\underline{\mathrm{X}}) & \longrightarrow & \mathrm{Bir}_2(X) \longrightarrow 1 \\ & & \| & & \cup| & & \cup| \\ 1 & \longrightarrow & H & \longrightarrow & \mathrm{Aut}_H('X) & \longrightarrow & \mathrm{Aut}(X) \longrightarrow 1; \end{array}$$

see [2, Thm. 2.1].

Acceptable: All these groups are affine algebraic and are related to each other via the following commutative diagram:

$$\begin{array}{ccccccc} 1 & \longrightarrow & H & \longrightarrow & \mathrm{Aut}_H(\underline{\mathrm{X}}) & \longrightarrow & \mathrm{Bir}_2(X) \longrightarrow 1 \\ & & \| & & \cup| & & \cup| \\ 1 & \longrightarrow & H & \longrightarrow & \mathrm{Aut}_H('X) & \longrightarrow & \mathrm{Aut}(X) \longrightarrow 1 \end{array}$$

(see [2, Thm. 2.1]).

Acceptable: The following diagram commutes:

$$\begin{array}{ccc} C_c^\infty(\widetilde{W}_\iota) & \xrightarrow{\pi(f)_{|\widetilde{W}_\iota}} & C^\infty(\widetilde{W}_\iota) \\ {\scriptstyle \phi_\iota^*}\uparrow & & \uparrow{\scriptstyle \phi_\iota^*} \\ C_c^\infty(W_\iota) & \xrightarrow{A_f^\iota} & C^\infty(W_\iota) \end{array}$$

Acceptable: Then there is an isomorphism (ϕ, ψ) of K-graded algebras fitting into the commutative diagram:

$$\begin{array}{ccc} S & \xrightarrow{(\phi,\psi)} & S \\ & {\scriptstyle (\pi_1,\kappa_1)} \searrow \quad \swarrow {\scriptstyle (\pi_2,\kappa_2)} & \\ & R & \end{array}$$

In particular, ...

The following example shows an unacceptable placement of ending punctuation. Mark the period to be deleted.

Unacceptable: Then there is an isomorphism (ϕ, ψ) of K-graded algebras fitting into the commutative diagram:

$$\begin{array}{ccc} S & \xrightarrow{(\phi,\psi)} & S \\ & {\scriptstyle(\pi_1,\kappa_1)}\searrow \quad \swarrow{\scriptstyle(\pi_2,\kappa_2)} & \\ & R & \end{array} \quad .$$

In particular, ...

- Treat diagrams consistently within an article.

13.14. Equation numbers

The AMS allows authors discretion in setting displayed math. Displayed equations may be numbered or not. Numbering may be sequential throughout the paper, such as (1), (2), or by section, such as (1.1), (1.2), ..., (3.1), (3.2). Equations can be numbered concurrently with any other elements.

- Equation numbers are not required. Do not add numbers to unnumbered equations.
- Equation numbers are set to the left of displayed math. Move equation numbers that are set to the right.
- The vertical location of equation numbers should be retained if the placement is not confusing. An equation number may align with the first or last line of an equation or may be centered vertically on the equation.
- Displayed equations should be left as the author has grouped them unless they run over the margin.
- Letters and words may be used as equation numbers.

(C)
$$b_i = \begin{cases} \lceil n/(3 \cdot 2^{lb-(i+2)} \rceil, & 0 \le i \le lb - t - 2, \\ \lceil n/2^{lb-i} \rceil, & lb - t - 1 \le i \le lb. \end{cases}$$

Stet the font of the letter or word both in the display and when mentioned in text (but do ensure that the style for the same equation name is consistent throughout).

- In cross-references, equation numbers are enclosed in roman parentheses to match the original label and the parentheses are always roman.

13.15. Spacing in displays

- LaTeX will adjust spacing above and below displayed equations. If there is extra space above or below so that the spacing is not equal, mark to reduce space (usually uneven space occurs above the equation and is caused by a blank line before the equation code in the source file).
- Fix line overruns.
- Fix text or math that is touching—between lines or between characters.
- There is a two-quad (four-letter) space between two separate equations on one line and between an equation and a condition on that equation. However, if the author consistently used just one quad (two-letter) space, stet.

Correct:

$$\gamma'(s) = \sum_{n=b+1}^{\infty} \frac{f_n}{n!} s(s+1)\cdots(s+n-1) \sum_{i=0}^{n-1} \frac{1}{s+i}, \qquad s \notin \{-2,-3,\ldots,-b\}.$$

Correct:

$$T[x_i, \bar{x}_i] \geq 2r, \qquad T[x_i, h_i] \leq r$$

Acceptable:

$$T[v, x_i] \leq r+1, \quad T[v, \bar{x}_i] \leq r+1 \quad \text{for all } i$$

- Three or more separate equations on the same line are separated by a quad space.

$$T[x_i, \bar{x}_i] \geq 2r-\delta, \quad T[x_i, h_i] \leq r+\delta, \quad T[\bar{x}_i, h_i] \leq r+\delta$$

- A preposition has a quad space before and a word space after.

Correct:

$$X_i(z) = \left(\frac{\pi(i)z}{1-(1-\pi(i))z}\right)^b \quad \text{for } i < j$$

- Spacing is consistent around conjunctions. A word space, a quad space, or a two-quad space is acceptable as long as it's consistent on both sides.
- Stet spacing around operators and before punctuation in displays unless it's extremely tight or loose.

- Stet spacing of equations and phrases bracketed by a left brace as long as it's consistent and not confusing.

Correct:

$$\begin{cases} u_t - \delta u_{xxt} + auu_x = 0, & (x,t) \in \Omega \times (0,t_1), \\ u = 0, & (x,t) \in \partial\Omega \times (0,t_1), \\ u(x,0) = \varphi(x), & x \in \Omega. \end{cases}$$

- Stet spacing around math expressions and functions.

13.16. Breaking equations in text

- LaTeX will automatically break most math expressions correctly across lines in text, but bad line breaks are still a common occurrence and need the copy editor's attention. Most expressions are broken around an operator in text. A quick reference to which symbols are classified as operators and how to translate symbols into parts of speech is outlined below. This table also appears in Chapter 12 because of its foundational importance in learning how to edit mathematical text.

Operators:

Verbs: $= \neq < > \leq \geq \prec \succ \ll \gg \nleq \ngeq \subset \supset \in \ni \equiv \not\equiv \sim \not\sim$
$\simeq \cong \to \leftarrow \Rightarrow \Leftrightarrow \notin$

Conjunctions: $+ \; - \; \times \; \dot{+} \; \mp \; \cup \; \cap \; \vee \; \wedge \; \cdot \; \circ \; \oplus \; \otimes$

Fences: { } [ ] $\langle$ $\rangle$ ( ) | | $\|$ $\|$

Nouns: italic, Greek, German, Hebrew, and Cyrillic letters; numerals

Sigma-class symbols:

Collective signs: $\sum \; \prod \; \bigcup \; \bigcap \; \bigwedge \; \bigvee \; \bigoplus \; \bigotimes$

Integral: $\int$

See CMS, Table 12.1, for a more complete list; see also Table 1 on p. 105 for symbols that can be confused based on size.

In the examples below (taken from [**MIT**, section 3.2.2]), a / indicates an allowable break.

- Although LaTeX breaks math expressions after an operator in text, to fix a bad line break, expressions may be broken before or after an operator (or after a comma or semicolon) that *does not* occur between fences:

$$a + b/=/x(c - d)$$

- An equation may be broken at any word space (thick space):

$$y = 4n - 1 \Big/ (n = 0, 1, 2)$$

  If there is a choice, it is better to break at a thick space than before an operator.

- After a collective sign, no break is allowed until an operator occurs outside of fences:

$$\sum (a - b) \Big/ + \Big/ abc$$

- After an integral sign ($\int$), no break is allowed until a d occurs; then break after the next punctuation or at a verb.

$$\int a\,dx, \Big/ \quad \int a(a + b)(xy - w)\,dx \Big/ =$$

  Exception: $\int dx + dy$ (no break allowed).

- When a set of fences is followed directly by another set of fences, the equation may be broken between them, provided a times sign or a centered dot is inserted:

$$(a + b) \Big/ (c + d)$$

(Break at / and insert a times sign or a center dot, as appropriate, before the second set of fences.)

  Exceptions:

  (1) This rule does not apply if the fences are preceded by a sigma-class symbol.

  (2) Do not break at the slash (/) in a slashed fraction.

  (3) This rule does not apply to logic (see p. 13.16.1).

- Equations may be broken before or after an operator (or after a comma or semicolon) that occurs between fences if both of the following conditions are present:

  (1) if one of the opening fences (that has not closed) is *not* preceded directly by a noun, a fence, or sigma-class symbol, and

  (2) if the subsequent closing fences are *not* followed directly by a noun or a fence.

  It is good policy, however, to avoid breaking equations between fences whenever possible.

  NO BREAK ALLOWED:

$$x(a + b + c) \qquad (a + b - c)y \qquad \sum (a + b - c)$$

  BREAK ALLOWED, WHEN NECESSARY:

$$(a \log x \Big/ - b \sin(x/y)) \qquad ((\sin a - \cos b) \Big/ + \tan c \Big/ - (xy \cos b))$$

- Don't run in an equation the author has displayed; however, you may display an in-text equation to fix a bad line break.

13.16.1. Rules for mathematical logic. The rules for breaking mathematical expressions in logic are not always the same as for other branches of mathematics. Generally, expressions should not be broken within fences and should be broken before verbs and conjunctions. In logic "&" and "$\rightarrow$" have more weight than in other fields of mathematics. Considering the English equivalent of some symbols might help the copy editor in making correct breaks:

$\Rightarrow$ and $\rightarrow$ mean *implies* $\Leftrightarrow$ means *if and only if*

& and $\wedge$ mean *and*; $\vee$ means *or*.

All three are conjunctions which might take precedence over a verb for breaking purposes.

$\neg$ means *it is not true that*; $\exists$ means *there exists*; $\forall$ means *for all*.

Breaks occur before rather than after these symbols.

Do not use either a times sign or a centered dot when breaking at a fence; break without any added notation:

$$s = 0 \big/ \& \big/ V = 0 \qquad e^* = q(u) \big/ \rightarrow \big/ u = M(e^*, t)$$
$$\alpha \in Q \big/ \wedge \big/ \beta \in Q \big/ \wedge \big/ \alpha \neq \beta \big/ \rightarrow \big/ (\exists m) F(\alpha(m), \beta(m))$$

Note that in the mathematical logic examples above, it would be wrong to break at the $=$, $\neq$, or $\in$ signs.

13.17. Breaking and aligning equations in displays

- The AMS does not require authors to use an AMS journal style file, so many papers are submitted with margins that differ from the AMS standard. Many times this leads to equations not fitting within the margin after the AMS style file is applied. Copy editors will need to indicate to the compositor where to break equations that overrun the margin. **Do not rebreak equations that do not overrun the margin.**

  In general, breaking equations in displays follows the same rules as breaking equations in text except that, in displays, equations may be broken before an operator but *not* after an operator. Breaking displays tends to be more difficult because the more complicated material is usually set into display instead of text.

- Stet the alignment of multiline or multiequation displays if the author appears to have intentionally aligned them on the left or right, on the verb sign, or centered them, if the sense is clear and they do not overrun the margin.
- If a line overruns the margin by less than 1 pica, mark for negative space around the operators and instruct the compositor to squeeze the line.
- Operators should not appear at the end of lines in displayed equations. Either remove if repeated at beginning of next line or move to the beginning of the next line.

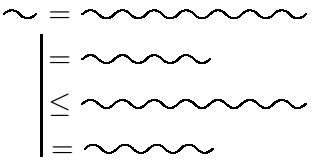
Correct:

$$\begin{aligned} 0 &= k_\Lambda(k(\rho(x)), k(\rho(y)) \\ &= \lim_{n\to\infty} k_\Lambda(\phi^{m_n}(k(x)), \phi^{m_n}(k(y))). \end{aligned}$$

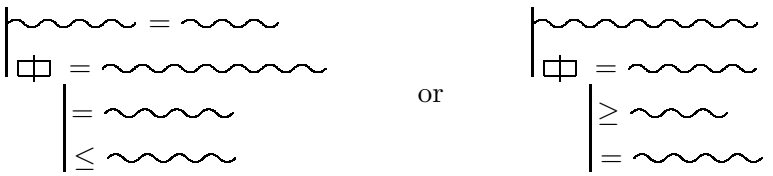
Incorrect:

$$\begin{aligned} 0 &= k_\Lambda(k(\rho(x)), k(\rho(y)) = \\ &= \lim_{n\to\infty} k_\Lambda(\phi^{m_n}(k(x)), \phi^{m_n}(k(y))). \end{aligned}$$

- Align multiline equations on operators: verbs are aligned with each other and conjunctions are aligned with each other (see section 13.16 for a list of operators).
  - **Break and align on verbs.**



If there is a long expression before the first verb, align succeeding verbs with a two-em quad indent from the left.



Example:

$$\begin{aligned} 0 &= k_\Lambda(k(\rho(x)), k(\rho(y)) = \lim_{n\to\infty} k_\Lambda(k(f^{m_n}(x)), k(f^{m_n}(y))) \\ &= \lim_{n\to\infty} k_\Lambda(\phi^{m_n}(k(x)), \phi^{m_n}(k(y))) = k_\Lambda(k(x), k(y)). \end{aligned}$$

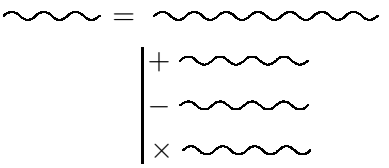
Example:

$$k_\Lambda(k(\rho(x)), k(\rho(y)) = \lim_{n\to\infty} k_\Lambda(k(f^{m_n}(x)), k(f^{m_n}(y)))$$
$$= \lim_{n\to\infty} k_\Lambda(\phi^{m_n}(k(x)), \phi^{m_n}(k(y))) = k_\Lambda(k(x), k(y)).$$

Example:

$$\left| \int_{\mathbb{R}^n} f(x) g_N(x) d\mu(x) \right|$$
$$\leq \sum_{k=1}^{\infty} |\lambda_k| \, \|a_k\|_{L^q_\mu} \left(\int_{S_k} |g_N(x) - m_{S_k}(g_N)|^{q'} d\mu(x) \right)^{1/q'}$$
$$\leq \sum_{k=1}^{\infty} |\lambda_k| \mu(S_k)^{1-1/p} \left(\frac{1}{\mu(S_k)} \int_{S_k} |g_N(x) - m_{S_k}(g_N)|^{q'} d\mu(x) \right)^{1/q'}.$$

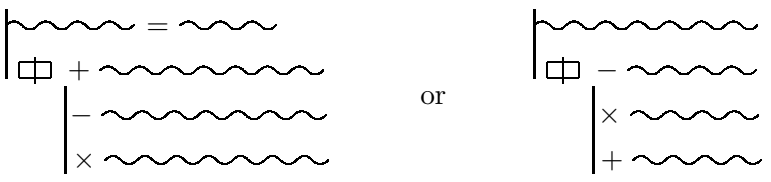
– **Break at conjunctions and align to the right of the first verb.**



Example:

$$ED_m(D_m - 1) = \frac{\widetilde{W}(m)}{m} + O(1) + \frac{1}{h_1^2} \log^2 m$$
$$+ 2\frac{1}{h_1} \left(\frac{h_2 - h_1^2}{h_1^2} - \frac{1}{h_1} \widehat{\gamma}'(-1) + \frac{\gamma - 1}{h_1} \right) \log m$$
$$- 2 \sum_{k \neq 0} \frac{\Gamma(s_k) \widehat{\gamma}(s_k)}{h^2(s_k)} m^{-1-s_k} \log m + O(1).$$

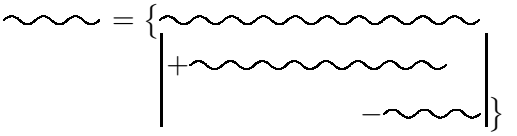
– **Break at conjunctions and align with a two-em quad from the left.**



Example:

$$
\begin{aligned}
&b^{\iota}_{f_t}(\phi_\iota(p), \xi/\tau; e, k) \\
&\quad + \int_{\tau^{-1}\Psi^{-1}(U)} e^{i\sum_{|\alpha|>0,j} c^j_\alpha(p)(\tau\zeta)^\alpha \xi_j/\tau} \alpha'_\iota\Big(p \cdot \exp_e\big(\tau \sum \zeta_i X_i\big)\Big) \\
&\quad \cdot \tau^d (f_t\beta)\Big(k \exp_e\big(\tau \sum \zeta_i X_i\big) k^{-1}\Big) \mathcal{J}(\tau\zeta) d\zeta \\
&\quad - \int_{\mathbb{R}^d} e^{i\sum_{|\alpha|>0,j} c^j_\alpha(p)(\tau\zeta)^\alpha \xi_j/\tau} \alpha'_\iota\Big(p \cdot \exp_e\big(\tau \sum \zeta_i X_i\big)\Big) \\
&\quad \cdot (c_0\beta)\Big(k \exp_e\big(\tau \sum \zeta_i X_i\big) k^{-1}\Big) e^{-b\|\sum \zeta_i X_i\|_\theta^{q/(q-1)}} \mathcal{J}(\tau\zeta) d\zeta + O(t).
\end{aligned}
$$

– **General rule: Always keep expressions visually within fences.** If the break occurs within a set of fences, the operator should line up to the right of the opening fence to indicate that this line of display belongs inside the fences.



Example:

$$
\begin{aligned}
e^{-u/\epsilon} = \Bigg[& D_1(b_1) e^{b_1/\epsilon} + \int_{b_1}^{u} f'''(t) e^{t/\epsilon} dt \\
& + e^{(c_2-u)/\epsilon} e^{-c_2/\epsilon} D_1(b_1) e^{b_1/\epsilon} + \int_{b_1}^{c_2} f'''(t) e^{t/\epsilon} dt \\
& + e^{-u/\epsilon} \int_{c_2}^{u} f'''(t) e^{t/\epsilon} dt \Bigg].
\end{aligned}
$$

Part 3

Appendices

Appendix A

Functions and Operators Set in Roman Type

These functions and operators are set in roman type in both roman and italic text; however, you may stet superscript and subscript italic functions and operators.

ad	adjoint	csc	cosecant
arccos	arc cosine	deg	degree
arcsin	arc sine	det	determinant
arctan	arc tangent	diag	diagonal
arg	argument	dim	dimension
Aut	automorphism	div	divergent, divergence
bin	binary	exp	exponential
bd or Bd	bound, boundary	Ext	extension
cl	closure	Gal	Galois group
coker	cokernel	gcd or g.c.d.	greatest common divisor
const	constant	GL	general linear group
cos	cosine	gr	group
cosh	hyperbolic cosine	grad	gradient
cot or ctg	cotangent	hom or Hom	homology, homomorphism
coth	hyperbolic cotangent	id	identity
Cov	covariance	Im or $\Im$	image or imaginary part

inf	inferior or infimum
int	interior or interval
ker, Ker	kernel, Kernel
lg	special logarithm
lim	limit
lim inf	limit inferior
lim sup	limit superior
ln	natural logarithm
log	logarithm
Log	principal log
max	maximum
min	minimum
mod	modulo
Prob/Pr	probability
pt	point
Rank, rank	Rank, rank
Re or $\mathfrak{R}$	real part
sec	secant
sech	hyperbolic secant
sgn	sign
sin	sine
sinh	hyperbolic sine
SL	special linear group
SO	special orthogonal group
spin or Spin	spin
Sp	symplectic
SU	special unitary group
sup	superior
supp	support
tan	tangent
tanh	hyperbolic tangent
tg	special tangent
tr or Trace	trace
Var	variance
w	weak star
wr	wreath product
Wr	Wronskian

Appendix B

Some Mathematician Names

When combining two author names to create an adjectival form, the en dash is used: Cauchy–Schwarz formula. This is to make the use of two authors' names distinct from a hyphenated author name, e.g., Heath-Brown, Swinnerton-Dyer, Colliot-Thélène. The limiting factor in this, however, is the copy editor's ability to track down the names to ensure accuracy between names that are combined as adjectives and those that are just the author's name. For this reason, we will allow hyphens in all such constructions when they are used consistently. It is important for the copy editor to understand this distinction and to honor it whenever possible.

Note the difference between the suffixes "-ean" and "-ian" in creating the adjectival form of an author name. By scholarly convention, ancient/classical mathematicians (generally Greek) take "-ean", while mathematicians of the current era take "-ian". It is acceptable for the adjectival form to be capitalized or lowercased, as long as its use is consistent.

Abel (Abelian; stet lowercase if consistent)
Ackermann
Arnol′d (Arnold; stet if consistent)
Arrhenius
Artin (Artinian; stet lowercase if consistent)
Arzelà
Ascoli
Babuska
Banach

Bayes (Bayesian; stet lowercase if consistent)
Bénard
Bernoulli
Bessel
Bézout
Bhattacharya
Birkhoff
Blaschke
Bohr
Bochner
Boltzmann
Boole (Boolean; stet lowercase if consistent)
Borel
Boussinesq
Brouwer
Browder
Brown (Brownian; stet lowercase if consistent)
Burgers (Burgers's equation, but the Burgers equation)
Carathéodory
Cauchy (Cauchy–Schwarz)
Cayley
Cesàro
Chandrasekhar
Chapman (Chapman–Jouguet)
Chebyshev (sometimes Tchebyshev or Tschebycheff when referencing T-systems)
Cholesky (Choleski)
Christoffel
Clairaut
Clapeyron
Clausius (Clausius–Clapeyron)
Colliot-Thélène
Cotes
Couette
Coulomb
Courant
Courdesses
Cramer (Cramer's rule)
Cramér (H. Cramér–Rao)
Crank (Crank–Nicolson)
d'Alembert
Damköhler
Darboux

de Boor
de Bruijn
de Bruin
Dedekind
de Graaf
de Vries
de Moivre
De Morgan
Debye
Delves
Descartes (Cartesian), René
Dini
Dirichlet
Eisenstein (not to be confused with "Einstein")
Erdélyi
Erdős
Erlang
Euclid (Euclidean; stet lowercase if consistent)
Euler (pronounced "oiler"—preceded by "an" not "a";
Eulerian—stet lowercase if consistent)
Faber (Faber–Padé)
Fatou
Fejér
Fermat
Fibonacci
Filippov
Fitzhugh (Fitzhugh–Nagumo)
Fokker (Fokker–Planck)
Fourier
Fréchet
Fredholm
Frobenius
Fubini
Fuchs (Fuchsian)
Galerkin
Galois
Gâteaux
Gauss (Gauss–Seidel)
Gel′fand (or Gelfand; Gel′fand–Levitan)
Gelfond
Gödel
Godunov
Goertzel

Gordon (sine-Gordon)
Grassmann (Grassmannian; stet lowercase if consistent)
Gronwall
Hadamard
Hahn (Hahn–Banach)
Hamilton (Hamiltonian; stet lowercase if consistent)
Hankel
Hausdorff
Heath-Brown
Heaviside
Helmholtz
Herglotz
Hermite (Hermitian; stet lowercase if consistent)
Hesse (Hessian; stet lowercase if consistent)
Hilbert
Hölder
Holmgren
Hopf
Hugoniot
Huygens (Huyghens)
Ito (Itô, Itō)
Jacobi (Jacobian; stet lowercase if consistent)
Jouguet
Joule
Kepler
Khinchine
Kirchhoff
Klein (Klein–Gordon)
Kolmogorov
Korteweg (Korteweg–de Vries)
Kronecker
Krylov
Kuhn (Kuhn–Tucker)
Kutta
l'Hôpital (also spelled "l'Hospital"; preferred spelling is "l'Hôpital")
Ladyzhenskaya
Lagrange (Lagrangian; stet lowercase if consistent)
Laguerre
Lamé
Langmuir
Laplace
Laurent

Lebesgue
Lefschetz
Legendre
Leibniz
Levi-Civita
Levitan
Lévy
Lie
Liouville
Lipschitz (Lifshits)
Liptser
Łojasiewicz
Lovàsz
Lyapunov (Liapunov)
Mac Lane
Maclaurin
Markov (Markovian; stet lowercase if consistent)
Mattheij
Mathieu
Megiddo
Meijer
Minkowski
Möbius (Moebius)
Nagumo (Fitzhugh–Nagumo)
Napier
Navier (Navier–Stokes)
Neumann
Newton (Newton–Raphson)
Nicolson
Nikodým
Noether (Noetherian; stet lowercase if consistent)
Nordsieck
Obreshkov
Odlyzko
Padé
Parseval
Pascal
Perron
Picard
Planck
Poincaré
Poiseuille
Poisson

Pólya
Pontryagin
Poussin
Prandtl
Prufer
Pythagoreas (Pythagorean theorem) Radon
Raphson
Rayleigh (Rayleigh–Ritz)
Reade
Reinsch
Rényi
Riccati
Richtmyer
Riemann (Riemannian; stet lowercase if consistent)
Riesz
Ritz
Rodrigues
Rolle
Runge (Runge–Kutta)
Schlicht
Schrödinger (Schroedinger)
Schur
Schwarz (Schwarz–Christoffel, Cauchy–Schwarz)
Schwartz
Shilov
Siegel
Stefan
Steinitz
Stieltjes
Stifel
Stokes
Student
Sturm (Sturm–Liouville)
Sussmann
Swinnerton-Dyer (Birch–Swinnerton-Dyer)
Szegő
Szemerédi
Tikhonov
Toeplitz
Tukey
Turán
de la Valleé-Poussin
van der Pol
van der Waals

van der Waarden (Waerden)
Vandermonde
Vlasov (Vlasov–Poisson)
Volterra
von Koch
von Neumann
Voronoi
Wessel
Weierstrass (Weierstrass approximation)
Weil
Weiner
Weyl
Wiener
Wronski (Wronskian; stet lowercase if consistent)

Appendix C

Common Abbreviations and Latin Expressions

There are a number of standard scholarly abbreviations and Latin expressions that appear in text without explanation. The list below shows some of the more common examples (see CMS, section 10.43, for a comprehensive list of abbreviations). Unless otherwise marked, all abbreviations and expressions listed below are text dependent.

a.a.	almost always
a.e.	almost everywhere
a.s.	almost surely
a priori	formed or conceived beforehand, presumed
cf.	compare (*confer*, never c.f.; not a substitute for "see")
e.g.	for example (*exempli gratia*; not a substitute for "i.e.")
et al.	and others (*et alii, et alia*)
etc.	and so forth (*et cetera*)
ibid	in the same place (*ibidem*)
i.e.	that is (*id est*; not a substitute for "e.g.")
iff	if and only if
i.i.d.	independent and identically distributed
loc. cit.	in the place cited (*loco citato*)
op. cit.	in the work cited (*opere citato*, but try to avoid this)
viz.	namely (*videlicet*)
w.r.t. or wrt	with respect to
w.l.o.g. or wlog	without loss of generality

Appendix D

Nomenclature

The following list presents some mathematical nomenclature as well as words that are often misspelled or mishyphenated; it represents AMS preferred use. Please note, however, that the copy editor should stet an author's preference *when used consistently*, but if an author's usage is inconsistent within a paper, change all occurrences to AMS preferred use.

A compound marked with an asterisk is hyphenated *only* when it precedes the noun it modifies (see CMS, section 7.85, for exhaustive guidance on hyphenation). There are four mathematics-specific exceptions to this rule: "well-behaved", "well-defined", "well-order", and "well-posed". The copy editor should *not* change any of these four expressions when hyphenated.

- ✓ well-behaved: In mathematics, a pathological phenomenon having intuitive, easy to handle properties; especially, having a finite derivative of all orders at all points, and having no discontinuities.
- ✓ well-defined: In mathematics an expression is called "well-defined" or "unambiguous" if its *definition* assigns it a unique interpretation or value; otherwise, the expression is said to be "not well-defined" or "ambiguous".
- ✓ well-order: In mathematics a "well-order" (or "well-ordering" or "well-order relation") on a set S is a total "order" on S with the property that every nonempty subset of S has a least element in this "ordering". The set S together with the "well-order relation" is called a "well-ordered set".
- ✓ well-posed: As defined by Jacques Hadamard, a problem is well-posed (or correctly set) if (a) it has a solution, (b) the solution is unique, (c) the solution depends continuously on data and parameters.

abelian/Abelian
*above-mentioned
abscissa
acknowledgment
adduce
adelic
adjoint/adjoined
admissible
analogue (noun)
analog (adjective)
analyticity
ansatz
archimedean/Archimedean
azimuth
bijection
Boole/boolean
byproduct
canceled/canceling, but cancellation
canonicity
cardioid
cartesian/Cartesian but Descartes
clopen
concatenation
contragradient
contragredient
coordinatewise
cross section (noun)
dependences
dependencies
descendant (noun)
descendent (adjective)
deviatoric
dihedral
discretized
eikonal
embedding
epitrochoid
étale
extendible
euclidean/Euclidean

gaussian/Gaussian
homorphism
homomorphism (different meaning from homeomorphism; this is an algebraic term)
homeomorphism (different meaning from homomorphism; this is a topological term)
homogeneous (homogenous)
hysteresis
imbedding
infimum
kernel
labeled
*left-hand
martingale
media (plural of medium)
metastable
minuscule
modeled
normable
occurrence
occurring
online
oscillatory
osculatory
paradigm
parallelepiped
parameterize, parametrize (stet author's use)
parsable, parsing
perturbation
poloid, poloidal
precede, preceding
proceed, proceeding
pseudo (noun compounds open, adjective compounds hyphenated)
quasi (noun compounds open, adjective compounds hyphenated)
riemannian/Riemannian
*right-hand
self- (see section 12.7.5)
separatrices
separatrix

setup (noun)
*set-up (adjective)
set up (verb)
*so-called
solenoidal
soliton
stoichiometry
stratagem
subtracted
substracted
subsumed
supremum
toroidal
traveled
*well-known (adjective before noun, but not if it's modified:
very well known)
zeros
zeroth

Variables in Various Fonts and Languages

Roman		German		Calligraphic	Script	BBB
a	A	$\mathfrak{a}$	$\mathfrak{A}$	$\mathcal{A}$	$\mathscr{A}$	$\mathbb{A}$
b	B	$\mathfrak{b}$	$\mathfrak{B}$	$\mathcal{B}$	$\mathscr{B}$	$\mathbb{B}$
c	C	$\mathfrak{c}$	$\mathfrak{C}$	$\mathcal{C}$	$\mathscr{C}$	$\mathbb{C}$
d	D	$\mathfrak{d}$	$\mathfrak{D}$	$\mathcal{D}$	$\mathscr{D}$	$\mathbb{D}$
e	E	$\mathfrak{e}$	$\mathfrak{E}$	$\mathcal{E}$	$\mathscr{E}$	$\mathbb{E}$
f	F	$\mathfrak{f}$	$\mathfrak{F}$	$\mathcal{F}$	$\mathscr{F}$	$\mathbb{F}$
g	G	$\mathfrak{g}$	$\mathfrak{G}$	$\mathcal{G}$	$\mathscr{G}$	$\mathbb{G}$
h	H	$\mathfrak{h}$	$\mathfrak{H}$	$\mathcal{H}$	$\mathscr{H}$	$\mathbb{H}$
i	I	$\mathfrak{i}$	$\mathfrak{I}$	$\mathcal{I}$	$\mathscr{I}$	$\mathbb{I}$
j	J	$\mathfrak{j}$	$\mathfrak{J}$	$\mathcal{J}$	$\mathscr{J}$	$\mathbb{J}$
k	K	$\mathfrak{k}$	$\mathfrak{K}$	$\mathcal{K}$	$\mathscr{K}$	$\mathbb{K}$
l	L	$\mathfrak{l}$	$\mathfrak{L}$	$\mathcal{L}$	$\mathscr{L}$	$\mathbb{L}$
m	M	$\mathfrak{m}$	$\mathfrak{M}$	$\mathcal{M}$	$\mathscr{M}$	$\mathbb{M}$
n	N	$\mathfrak{n}$	$\mathfrak{N}$	$\mathcal{N}$	$\mathscr{N}$	$\mathbb{N}$
o	O	$\mathfrak{o}$	$\mathfrak{O}$	$\mathcal{O}$	$\mathscr{O}$	$\mathbb{O}$
p	P	$\mathfrak{p}$	$\mathfrak{P}$	$\mathcal{P}$	$\mathscr{P}$	$\mathbb{P}$
q	Q	$\mathfrak{q}$	$\mathfrak{Q}$	$\mathcal{Q}$	$\mathscr{Q}$	$\mathbb{Q}$
r	R	$\mathfrak{r}$	$\mathfrak{R}$	$\mathcal{R}$	$\mathscr{R}$	$\mathbb{R}$
s	S	$\mathfrak{s}$	$\mathfrak{S}$	$\mathcal{S}$	$\mathscr{S}$	$\mathbb{S}$
t	T	$\mathfrak{t}$	$\mathfrak{T}$	$\mathcal{T}$	$\mathscr{T}$	$\mathbb{T}$
u	U	$\mathfrak{u}$	$\mathfrak{U}$	$\mathcal{U}$	$\mathscr{U}$	$\mathbb{U}$
v	V	$\mathfrak{v}$	$\mathfrak{V}$	$\mathcal{V}$	$\mathscr{V}$	$\mathbb{V}$
w	W	$\mathfrak{w}$	$\mathfrak{W}$	$\mathcal{W}$	$\mathscr{W}$	$\mathbb{W}$
x	X	$\mathfrak{x}$	$\mathfrak{X}$	$\mathcal{X}$	$\mathscr{X}$	$\mathbb{X}$
y	Y	$\mathfrak{y}$	$\mathfrak{Y}$	$\mathcal{Y}$	$\mathscr{Y}$	$\mathbb{Y}$
z	Z	$\mathfrak{z}$	$\mathfrak{Z}$	$\mathcal{Z}$	$\mathscr{Z}$	$\mathbb{Z}$

Hebrew		Others		Others	
aleph	$\aleph$	partial	∂	Weierstrass p	$\wp$
beth	$\beth$	complement	$\complement$	script l	ℓ
daleth	$\daleth$	imaginary	$\Im$	BBB "one"	$\mathbb{1}$
eth	$\eth$	real	$\Re$	Cyrillic "sha"	Ш
gimel	$\gimel$	nabla	∇	mho	$\mho$

Greek			Greek variants		
alpha	α	A			
beta	β	B			
gamma	γ	Γ	varGamma		$\mathit{\Gamma}$
delta	δ	Δ	varDelta		$\mathit{\Delta}$
epsilon	ϵ	E	varepsilon	ε	
zeta	ζ	Z			
eta	η	H			
theta	θ	Θ	vartheta	ϑ	$\mathit{\Theta}$
iota	ι	I			
kappa	κ	K	varkappa	$\varkappa$	
lambda	λ	Λ	varLambda		$\mathit{\Lambda}$
mu	μ	M			
nu	ν	N			
xi	ξ	Ξ	varXi		$\mathit{\Xi}$
omicron	o	O			
pi	π	Π	varpi	ϖ	$\mathit{\Pi}$
rho	ρ	P	varrho	ϱ	
sigma	σ	Σ	varsigma	ς	$\mathit{\Sigma}$
tau	τ	T			
upsilon	υ	Υ	varUpsilon		$\mathit{\Upsilon}$
phi	ϕ	Φ	varphi	φ	$\mathit{\Phi}$
psi	ψ	Ψ	varPsi		$\mathit{\Psi}$
chi	χ	X			
omega	ω	Ω	varOmega		$\mathit{\Omega}$

Appendix F

Commonly Confused Words

Be careful not to confuse the words in the following (very brief) list. Check the dictionary or query the author to resolve inconsistencies. For more extensive guidance, see CMS, section 5.220.

- affect vs. effect
- analogue (noun) vs. analog (adjective)
- assure vs. ensure vs. insure
- between vs. among
- bibliography (book) vs. references (journal)
- cite vs. site
- comprise vs. compose
- corrigenda (plural) vs. corrigendum (singular)
- currently vs. presently
- datum vs. data ("data" *always* takes a plural verb)
- dependences and dependances vs. dependencies
- descendant (noun) vs. descendent (adjective)
- dilation vs. dilatation
- discrete vs. discreet
- errata (plural) vs. erratum (singular)
- farther vs. further
- foreword vs. preface

- if vs. whether
- imply vs. infer
- indexes vs. indices
- lay vs. lie (≈ lay=place, lie=recline)
- less vs. fewer
- maybe vs. may be
- on vs. upon
- precede, preceding vs. proceed, proceeding
- principle vs. principal
- proved vs. proven
- quibu vs. abacus
- quote (verb) vs. quotation (noun)
- substracted vs. subtracted
- till vs. until (never 'til)
- toward (American English) vs. towards (British English) (backward, forward, upward, downward, afterward)
- who vs. whom (≈ who=he, whom=him)
- zeros (American English) vs. zeroes (British English)

Appendix G

Sample Edited Article

This appendix presents a sample of an author's original manuscript and the edited AMS output. Each page of the author's original and the AMS output are laid out on facing pages, with the original on the left-hand page and the AMS output on the right-hand page. The AMS output has been marked up by hand. The final page of this appendix shows a completed AMS Journal Article Checklist and Style Sheet.

Please note that this "paper" is complete gibberish: it was assembled from bits and pieces of works chosen for their variety of problems, and it was further mangled by the authors of this guide to have maximum instructive effect. These really are commonly encountered problems in copy editing for the AMS.

ON CONJECTURES OF BALANCED PRESENTATIONS OF THE TRIVIAL GROUP BY ANDREWS AND CURTIS

S.V. IVANOV

ABSTRACT. It is shown that the original Andrews–Curtis conjecture (AC-conjecture) on balanced presentations of the trivial group is equivalent to its "cyclic" version in which, in place of arbitrary conjugations, one can use only cyclic permutations. This, in particular, proves a satellite conjecture of Andrews and Curtis [AC66] made in 1966. We also consider a more restrictive "cancellative" version of the cyclic AC-conjecture with and without stabilizations and show that the restriction does not change the AC-conjecture when stabilizations are allowed. On the other hand, the restriction makes the conjecture false when stabilizations are not allowed.

1. INTRODUCTION

In 1965, Andrews and Curtis [AC65] put forward a conjecture on balanced presentations of the trivial group and indicated some interesting topological consequences of their conjecture related to the 4-dimensional and 3-dimensional Poincaré conjectures. Since then both the 4-dimensional and 3-dimensional Poincaré conjectures have been established, however, the Andrews–Curtis conjecture remains unsettled and has become one of the most notorious hypotheses in group theory and low-dimensional topology. In this paper, we show that the AC-conjecture is equivalent to its more restrictive "cyclic" version in which, in place of arbitrary conjugations, one can use only cyclic permutations. This, in particular, proves a satellite conjecture of Andrews and Curtis [AC66, Conjecture 3] made in 1966.

Let $\mathcal{A} = \{a_1, \dots, a_m\}$ be an alphabet, $\mathcal{A}^{-1} := \{a_1^{-1}, \dots, a_m^{-1}\}$, where a_i^{-1} is the inverse of a letter $a_i \in \mathcal{A}$, $\mathcal{A}^{\pm 1} := \mathcal{A} \cup \mathcal{A}^{-1}$, and $\mathcal{F}(\mathcal{A})$ denote the free group over $\mathcal{A}$ whose nontrivial elements are considered as reduced words over $\mathcal{A}^{\pm 1}$.

Let $\mathcal{W} = (W_1, \dots, W_n)$ be an n-tuple of elements of $\mathcal{F}(\mathcal{A})$. Recall that *Nielsen operations* over $\mathcal{W}$ have two types and are defined as follows.

(T1) For some i, W_i is replaced with its inverse W_i^{-1}.
(T2) For some pair of distinct indices i and j, W_i is replaced with W, where $W = W_i W_j$ in $\mathcal{F}(\mathcal{A})$.

Consider operations of a third type so that

(T3) For some i, W_i is replaced with a word W such that W_i and W are conjugate in $\mathcal{F}(\mathcal{A})$, i.e., $W = S W_i S^{-1}$ in $\mathcal{F}(\mathcal{A})$ for some $S \in \mathcal{F}(\mathcal{A})$.

The main technical result of this paper is the following.

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(Communicated by Pham Huu Tiep)

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2

Theorem 1.1. *Suppose that a balanced presentation (1.2) defines the trivial group, the m-tuple $\mathcal{R} = (R_1, \ldots, R_m)$ is cyclically reduced and the original AC-conjecture holds true for all balanced presentations in ranks $< m$. If the original AC-conjecture holds true for the balanced presentation (1.2) then the cyclic version of the AC-conjecture also holds for (1.2).*

As easy consequences of Theorem 1.1 we will obtain the following 3 corollaries.

Corollary 1.2. Let $r \geq 2$ be an integer. The original AC-conjecture is true for all balanced pesentations in ranks $\leq r$ if and only if the cyclic version of the AC-conjecture is true for all balanced presentations in ranks $\leq r$.

Corollary 1.3. The original AC-conjecture holds true, if and only if the cyclic version of the AC-conjecture holds true.

Corollary 1.4. A satelite hypothesis of Andrews and Curtis [AC66, Conjecture 3] holds true. This hypothesis claims for $m = 2$ that if $\mathcal{R} = (R_1, R_2)$ can be brought to (a_1, a_2) by a finite sequence of operations (T1)–(T3), then this result can also be achieved by operations (T1), (T2), (T3).

More generally, if $r \geq 2$ is an integer and every m-tuple $\mathcal{R} = (R_1, \cdots, R_m)$, where $2 \leq m \leq r$, that defines the trivial group by (1.2), can be transformed to $(a_1, \ldots, a_m)$ by a finite sequence of operations (T1)–(T3), then such transformation can also be done by operations (T1), (T2), (T3).

This gives under skew Howe duality:

$$q^{-2}V_0 \oplus V_0 \oplus V_0 \oplus q^2V_0 \longrightarrow \begin{pmatrix} 0 & \mathrm{id} & \mathrm{id} & 0 \\ 0 & 0 & 0 & \mathrm{id} \end{pmatrix} V_0 \bigoplus q^2V_0.$$

Consider the vector space $\bigwedge^N(\mathbb{C}^n \otimes \mathbb{C}^m)$, which carries commuting actions of $\mathfrak{sl}_n$ and $\mathfrak{gl}_m$. The $\mathfrak{gl}_m$ weight space decomposition

$$\bigwedge^N(\mathbb{C}^n \otimes \mathbb{C}^m) \cong \bigoplus_{N=\sum a_i} \wedge^{a_1}\mathbb{C}^n \otimes \ldots \otimes \wedge^{a_m}\mathbb{C}^n \tag{1.1}$$

gives a functor $U(\mathfrak{gl}_m) \to P_{\mathbf{c}}(\mathfrak{sl}_n)$, where

(1.2)
$$P_{\mathbf{c}}(2, Z_2) = c_0 + c_1 + c_2 + c_3 + 2c_4 + c_5 + c_6 + c_7 + 2c_8 + c_9 + c_{10} + 2c_{11} + c_{12} + 2c_{13} + 4c_{14}$$

2. Some Essential Proofs

We start with two lemmas

Lemma 2.1. *For every letter $a_j \in \mathcal{A}$, and every word U_i in $\mathcal{U}$ one may assume that the number of occurrences of a_j in words U_i, U_i^{-1} is not one.*

Proof. Suppose, on the contrary, that the words U_i, U_i^{-1} contain a single occurrence of a letter $a_j \in \mathcal{A}$. Reindexing and using operations (T1), (T3) if necessary, we may assume that $i = j = 1$ and $U_1 \equiv a_1U_{1,0}$, where $U_{1,0}$ has no occurrences of a_j and a_j^{-1}. Applying operations (T1)-(T3), we can turn $\mathcal{U}$ into $(U_1, V_2, \ldots, V_m)$,

Theorem 1.1. *Suppose that a balanced presentation (1.2) defines the trivial group, the m-tuple $\mathcal{R} = (R_1, \dots, R_m)$ is cyclically reduced and the original AC-conjecture holds true for all balanced presentations in ranks $< m$. If the original AC-conjecture holds true for the balanced presentation (1.2) then the cyclic version of the AC-conjecture also holds for (1.2).*

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More generally, if $r \geq 2$ is an integer and every m-tuple $\mathcal{R} = (R_1, \dots, R_m)$, where $2 \leq m \leq r$, that defines the trivial group by (1.2), can be transformed to $(a_1, \dots, a_m)$ by a finite sequence of operations (T1)–(T3), then such transformation can also be done by operations (T1), (T2), (T3).

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gives a functor $U(\mathfrak{gl}_m) \to P_{\mathbf{c}}(\mathfrak{sl}_n)$, where

$$P_{\mathbf{c}}(2, Z_2) = c_0 + c_1 + c_2 + c_3 + 2c_4 + c_5 + c_6 + c_7 + 2c_8 + c_9 + c_{10} + 2c_{11} + c_{12} + 2c_{13} + 4c_{14} \tag{1.2}$$

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where $V_2, \dots, V_m$ have no occurrences of letters a_1, a_1^{-1}. Hence, the presentation $< a_2, \dots, a_m \,\|\, V_2, \dots, V_m >$ defines the trivial group and, by the induction hypothesis on m, the $(m-1)$-tuple $(V_2, \dots, V_m)$ can be transformed into $(a_2, \dots, a_m)$ by EN-operations (T1)–(T3). Consequently, using EN-operations (T1)–(T3), we can turn the m-tuple $\mathcal{U}$ into $(U_1, a_2, \dots, a_m)$ and, hence, into $(a_1, a_2, \dots, a_m)$. The proof is complete. □

Reindexing if necessary, we may also assume that $s = 1$ and $t = 2$, hence $R_1(k+1) = R_1(k)R_2(k)$ in $\mathcal{F}(\mathcal{A})$. Let $|W|$ denote the length of a word W.

Lemma 2.2. *Up to cyclic permutations of the words $\bar{R}_1(k+1)$, U_1, U_2, one may assume that the cyclically reduced word $\bar{R}_1(k+1)$, conjugate to $R_1(k+1)$ in $\mathcal{F}(\mathcal{A})$, has one of the following four forms (F1)–(F4), depicted in Figs. 1(a)–(c).*

(F1) $\bar{R}_1(k+1) \equiv U_1 C U_2 C^{-1}$, *where* $|C| > 0$, *see Fig. 1(a).*
(F2) $\bar{R}_1(k+1) \equiv DE$, *where* $U_1 \equiv DP^{-1}$, $U_2 \equiv PE$, *and* $|D|, |E| > 0$, *see Fig. 1(b).*
(F3) $\bar{R}_1(k+1) \equiv D$ *and* $U_1 \equiv DCU_2^{-1}C^{-1}$, *where* $|C| \geq 0$, *see Fig. 1(c).*
(F4) $\bar{R}_1(k+1) \equiv D$ *and* $U_2 \equiv DCU_1^{-1}C^{-1}$, *where* $|C| \geq 0$, *see Fig. 1(c).*

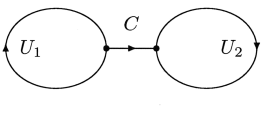

Fig. 1(a)

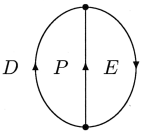

Fig. 1(b)

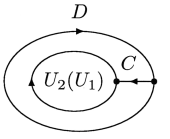

Fig. 1(c)

Proof. It follows from the definitions that, letting $S_1 := S_1(k)$ and $S_2 := S_2(k)$, we have the following equalities

$$R_1(k) \equiv S_1 U_1 S_1^{-1}, \quad R_2(k) \equiv S_2 U_2 S_2^{-1}, \quad R_1(k+1) \equiv S_1 U_1 S_1^{-1} S_2 U_2 S_2^{-1},$$
$$R_1(k+1) \equiv S_1(k+1)\bar{R}_1(k+1)S_1(k+1)^{-1}.$$

Consider the following properties of a reduced word W over the alphabet $\mathcal{A}^{\pm 1}$.

(P) For a given letter $a \in \mathcal{A}^{\pm 1}$ there are distinct letters $b, c \in \mathcal{A}^{\pm 1}$ such that ab and ac occur in the words W, W^{-1}.
(Q) For every letter $a \in \mathcal{A}^{\pm 1}$ there are distinct letters $b, c \in \mathcal{A}^{\pm 1}$, depending on a, such that ab and ac occur in the words W, W^{-1}.

To analyze possible cancellations in the product $S_1 U_1 S_1^{-1} S_2 U_2 S_2^{-1}$, we consider a disk diagram Δ over the group presentation

$$\mathcal{P}_U =< a_1, \dots, a_m \,\|\, U_1, U_2 > . \tag{2.1}$$

where $V_2, \ldots, V_m$ have no occurrences of letters a_1, a_1^{-1}. Hence, the presentation $\langle a_2, \ldots, a_m \,\|\, V_2, \ldots, V_m \rangle$ defines the trivial group and, by the induction hypothesis on m, the $(m-1)$-tuple $(V_2, \ldots, V_m)$ can be transformed into $(a_2, \ldots, a_m)$ by EN-operations (T1)–(T3). Consequently, using EN-operations (T1)–(T3), we can turn the m-tuple $\mathcal{U}$ into $(U_1, a_2, \ldots, a_m)$ and, hence, into $(a_1, a_2, \ldots, a_m)$. The proof is complete. □

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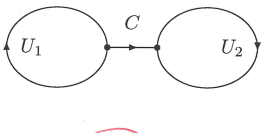


Fig. 1(a)

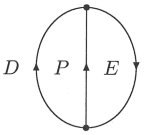
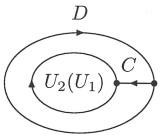


Fig. 1(b)



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(P) For a given letter $a \in \mathcal{A}^{\pm 1}$ there are distinct letters $b, c \in \mathcal{A}^{\pm 1}$ such that ab and ac occur in the words W, W^{-1}.
(Q) For every letter $a \in \mathcal{A}^{\pm 1}$ there are distinct letters $b, c \in \mathcal{A}^{\pm 1}$, depending on a, such that ab and ac occur in the words W, W^{-1}.

To analyze possible cancellations in the product $S_1 U_1 S_1^{-1} S_2 U_2 S_2^{-1}$, we consider a disk diagram Δ over the group presentation

$$\mathcal{P}_U = \langle a_1, \ldots, a_m \,\|\, U_1, U_2 \rangle. \tag{2.1}$$

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Recall that a disk diagram over a group presentation is a finite connected and simply connected 2-complex with a labeling function used for geometric interpretation of consequences of defining relations, details can be found in [I94], [LS], [O1]. We

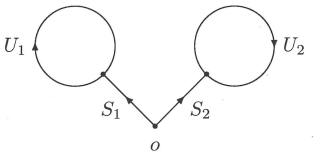


Fig. 2

define a disk diagram Δ over (2.1) so that Δ contains two faces Π_1, Π_2 whose clockwise oriented boundaries $\partial\Pi_1, \partial\Pi_2$ are labeled by words U_1, U_2, resp., and Δ contains a vertex o that is connected to $\partial\Pi_1$, $\partial\Pi_2$ by paths labeled by words S_1, S_2, resp., see Fig. 2. Then the clockwise oriented boundary $\partial|_o\Delta$ of Δ, starting at o, is labeled by the word $S_1U_1S_1^{-1}S_2U_2S_2^{-1}$, which we write in the form $\varphi(\partial|_o\Delta) \equiv S_1U_1S_1^{-1}S_2U_2S_2^{-1}$. □

3. Cancellative Cyclic Version of the AC-Conjecture

The significance and power of stabilizations does not look clear even in the special case of presentations coming from spines of the 3-sphere and is totally obscure for arbitrary presentations. For this reason, it seems worthwhile to consider a more restrictive version of the AC conjecture with and without stabilizations, called the cancellative cyclic version of the AC-conjecture and abbreviated as CCAC-conjecture.

Theorem 3.1. (a) *Suppose that a balanced presentation (3.1) defines the trivial group and the tuple $\mathcal{R} = (R_1, \dots, R_m)$ is cyclically reduced. Then the AC-conjecture with stabilizations holds true for (3.1) if and only if the CCAC-conjecture with stabilizations holds for (3.1).*

(b) *The CCAC-conjecture* without *stabilizations is false.*

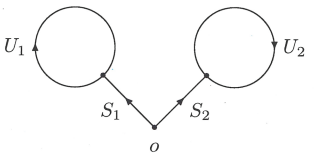
Proof. (a) First we will show that if the AC-conjecture with stabilizations holds for (3.1), then the CCAC-conjecture with stabilizations also holds for (3.1).

Assume that the AC-conjecture with stabilizations holds for (3.1), and $\mathcal{R}$ can be converted into $(a_1, \dots, a_m)$ by a sequence of EN-operations (T1)–(T2) and $2s$ stabilizations (T3). It is clear that in this process of turning $\mathcal{R}$ into $(a_1, \dots, a_m)$, one can do all s positive stabilizations (that increase $|\mathcal{A}|$) in the very beginning and all s negative stabilizations (or destabilizations that decrease $|\mathcal{A}|$) in the very end. Therefore, one can avoid stabilizations altogether and assume that the $(m+s)$-tuple

$$(\mathcal{R}, \mathcal{B}) := (R_1, \dots, R_m, b_1, \dots, b_s),$$

where $b_1, \dots, b_s$ are all new letters that were introduced by s positive stabilizations, can be converted into $m+s$-tuple $(\mathcal{A}, \mathcal{B}) := (a_1, \dots, a_m, b_1, \dots, b_s)$ by a sequence of EN-operations of type (T1)–(T3).

Recall that a disk diagram over a group presentation is a finite connected and simply connected 2-complex with a labeling function used for geometric interpretation of consequences of defining relations; details can be found in [5], [6], [7]. We define



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$$\begin{aligned}(3.1)\quad (U_1,U_2) &\to (xCU_2C^{-1}U_1,U_1,U_2)\to (U_1^{-1}CU_2^{-1}C^{-1}x^{-1},U_1,U_2)\to\\ &(U_1^{-1}CU_2^{-1}C^{-1}x^{-1},U_2)\to (xCU_2C^{-1}U_1,U_2^{-1})\to\\ &(xCU_2C^{-1}U_1,C^{-1}xCU_2,U_2^{-1})\to (xCU_2C^{-1}U_1,x,U_2^{-1})\to\\ &(CU_2C^{-1}U_1x,x^{-1},U_2^{-1})\to (CU_2C^{-1}U_1,x^{-1},U_2^{-1}).\end{aligned}$$

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4. Appendix

We denote by $\mathrm{Bir}(\partial^2)$ the group of birational transformations of the projective plane $\partial^2=\mathrm{Proj}(k[x,y,z])$ where k is an algebraically closed field. Let $C\subset\partial^2$ be a curve and let

$$\mathrm{Dec}(C)=\{\varphi\in\mathrm{Bir}(\partial^2),\ \varphi(C)\subset C \text{ and } \varphi|_C : C \dashrightarrow C \text{ is birational}\}$$

This group has been studied for curves of genus ≥ 1 in [BPV2009], where it is linked to the classification of finite subgroups of $\mathrm{Bir}(\partial^2)$. It has a natural subgroup $\mathrm{Ine}(C)$, the *inertia group* of C, consisting of elements that fix C, and Blanc, Pan and Vust give the following result: for any line $L\subset\partial^2$, the action of $\mathrm{Dec}(L)$ on L induces a split exact sequence

$$0\longrightarrow \mathrm{Ine}(L)\longrightarrow \mathrm{Dec}(L)\longrightarrow \mathrm{PGL}_2=\mathrm{Aut}(L)\longrightarrow 0$$

and $\mathrm{Ine}(L)$ is neither finite nor abelian and also it doesn't leave any pencil of rational curves invariant [BPV2009, Proposition 4.1]. Further they ask the question whether $\mathrm{Dec}(L)$ is generated by its elements of degree 1 and 2 [BPV2009, Question 4.1.2].

We give an affirmative answer to their question in the form of the following result, similar to the Noether-Castelnuovo theorem [Cas1901] which states that $\mathrm{Bir}(\partial^2)$ is generated by $\sigma\colon [x:y:z]\dashmapsto[yz:xz:xy]$ and $\mathrm{Aut}(\partial^2)=\mathrm{PGL}_3$.

Lemma 4.1. *Let $\rho\in\mathrm{Bir}(\partial^2)$ be a birational map and let $\phi\in\mathrm{Bir}(\partial^2)$ be a quadratic birational map with base points $q_1,q_2,q_3\in\partial^2$. For $1\leq i<j\leq 3$ we denote by $\ell_{ij}\subset\partial^2$ the line which joins the base points q_i and q_j. If $D(L,\rho)=k\geq 1$ we have*

$$D(L,\phi\rho)=\begin{cases}k+1 & \text{if } \rho(L)\in(\ell_{12}\cup\ell_{13}\cup\ell_{23})\setminus\mathrm{Bp}(\phi),\\ k & \text{if } \rho(L)\notin\ell_{12}\cup\ell_{13}\cup\ell_{23}\\ k & \text{if } \rho(L)=q_i \text{ for some } i, \text{ and } (\rho\phi)(L)\in\mathrm{Bp}(\phi^{-1}),\\ k-1 & \text{if } \rho(L)=q_i \text{ for some } i, \text{ and } (\rho\phi)(L)\notin\mathrm{Bp}(\phi^{-1})\end{cases}$$

Proof. We consider the minimal resolutions of ϕ; in Figure 1, the filled black dots denote the successive images of L, i.e., $\rho(L)$, $(\pi^{-1}\rho(L)$ and $(\eta\pi^{-1}\rho)(L)$ respectively. □

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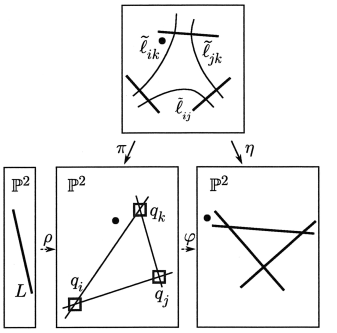

FIGURE 1. $D(L, \phi\rho) = k$; $\rho(L) \notin \ell_{12} \cup \ell_{13} \cup \ell_{23}$.

4.1. **Avoiding to send L to a curve of degree higher than 1.** By Lemma 4.1, any element $\rho \in \mathrm{Dec}(L)$ can be decomposed as

$$\rho = \rho_m \dots \rho_1$$

where each ρ_j is quadratic with three proper base points, and all of the successive images $((\rho_i \dots \rho_1)(L))_{i=1}^m$ of L are curves. The aim of this section is to show that the ρ_j even can be chosen so that all of these curves have degree 1. That is, we find a decomposition of ρ into quadratic maps such that all the successive images of L are lines. This means in particular that $\mathrm{Dec}(L)$ is generated by its elements of degrees 1 and 2.

Definition 4.2. A birational transformation of ∂^2 is called de Jonquières if it preserves the pencil of lines passing through $[1:0:0] \in \partial^2$. These transformations form a subgroup of $\mathrm{Bir}(\partial^2)$ which we denote by $\mathcal{J}$.

Remark 4.3. In [BPV2009], a de Jonquiéres map is defined by the slightly less restrictive property that it sends a pencil of lines to a pencil of lines. Given a map with this property, we can always obtain an element in $\mathcal{J}$ by composing from left and right with elements of PGL_3.

For a curve $C \subset \partial^2$ and a point p in ∂^2 or infinitely near, we denote by $m_C(p)$ the multiplicity of C in p. If it is clear from context which curve we are referring to, we will use the notation $m(p)$.

Lemma 4.4. *Let $\phi \in \mathcal{J}$ be of degree $e \geq 2$, and $C \subset \partial^2$ a curve of degree d. Suppose that*

$$\deg(\phi(C)) \leq d.$$

Then there exist two base points q_1, q_2 of ϕ different from $[1:0:0]$ such that

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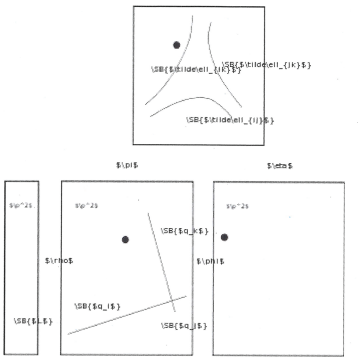
This inequality can be made strict in case $\deg(\phi(C)) < d$, with a completely analogous proof.



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$$\begin{aligned} d \geq \deg(\phi(C)) =& ed - (e-1)m_C(r_0) - \textstyle\sum_{i=1}^{e-1}(m_C(r_{2i-1}) + m_C(r_{2i})) \\ =& d + \sum_{i=1}^{e-1}(d - m_C(r_0) - m_C(r_{2i-1}) - m_C(r_{2i})). \end{aligned}$$

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TABLE 1. Dimensions of $S_1(\Gamma_0(N), \chi)$ for $N < 200$.

N	0	1	2	3	4	5	6	7	8	9
0	–	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	1^2	0	0	0	0	0	0
30	0	1^2	0	0	0	0	0	0	0	1^2
40	0	0	0	0	1^2	0	2^2	2^2	0	0
50	0	0	1^6	0	0	1^2	1^2	1^6	0	1^2
60	0	0	2^2	1^2	0	0	0	0	$1^2 1^4$	2^2
70	0	3^2	1^6	0	0	0	1^2	1^{10}	2^2	2^2
80	1^2	0	0	1^2	1^6	0	0	2^2	$1^{10}2^2$	0
90	0	0	3^2	$1^{10}2^2$	4^2	3^2	0	0	0	1^6
100	1^{10}	0	0	2^2	$2^2 2^6$	0	0	1^2	1^2	0
110	2^2	$1^6 1^6 3^2$	$1^4 2^2$	0	2^6	2^2	$1^{14}2^2$	$1^4 2^2$	2^2	4^2
120	2^2	0	0	0	$2^6 3^2$	0	2^2	2^2	1^2	1^{14}
130	0	2^2	2^2	$1^6 2^6$	0	2^2	$1^2 1^4 1^8 2^2 2^4$	0	4^2	1^2
140	$2^2 2^6$	4^2	6^2	4^2	$1^2 2^6$	$1^4 1^4$	0	1^{14}	$1^4 1^6 1^{18}$	0
150	0	3^2	$1^6 1^{18} 2^2 2^2$	0	2^{10}	$2^2 3^2$	$1^6 1^6 2^6 3^2$	0	4^2	4^2
160	$1^4 2^2$	$1^{22} 2^2$	0	0	$1^{10} 1^{10} 3^2$	$2^2 2^4$	2^2	5^2	$2^2 2^6 2^6$	0
170	0	$1^2 1^6 2^6 2^6$	1^2	0	4^2	2^2	$2^{10} 4^2$	2^2	0	2^2
180	$2^2 2^4 2^6$	0	0	$1^{10} 1^{10} 3^2$	$3^2 4^2$	0	$2^{10} 4^2$	0	6^2	$1^6 1^6 2^2$
190	6^2	6^2	2^2	0	0	$2^2 4^2$	$1^2 1^6$	0	2^6	4^2

Acknowledgements. The author wishes to thank the referee for many meticulous remarks.

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30	0	1^2	0	0	0	0	0	0	0	1^2
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50	0	0	1^6	0	0	1^2	1^2	1^6	0	1^2
60	0	0	2^2	1^2	0	0	0	0	$1^2 1^4$	2^2
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100	1^{10}	0	0	2^2	$2^2 2^6$	0	0	1^2	1^2	0
110	2^2	$1^6 1^6 3^2$	$1^4 2^2$	0	2^6	2^2	$1^{14}2^2$	$1^4 2^2$	2^2	4^2
120	2^2	0	0	0	$2^6 3^2$	0	2^2	2^2	1^2	1^{14}
130	0	2^2	2^2	$1^6 2^6$	0	2^2	$1^2 1^4 1^8 2^2 2^4$	0	4^2	1^2
140	$2^2 2^6$	4^2	6^2	4^2	$1^2 2^6$	$1^4 1^4$	0	1^{14}	$1^4 1^6 1^{18}$	0
150	0	3^2	$1^6 1^{18} 2^2 2^2$	0	2^{10}	$2^2 3^2$	$1^6 1^6 2^6 3^2$	0	4^2	4^2
160	$1^4 2^2$	$1^{22} 2^2$	0	0	$1^{10} 1^{10} 3^2$	$2^2 2^4$	2^2	5^2	$2^2 2^6 2^6$	0
170	0	$1^2 1^6 2^6 2^6$	1^2	0	4^2	2^2	$2^{10} 4^2$	2^2	0	2^2
180	$2^2 2^4 2^6$	0	0	$1^{10} 1^{10} 3^2$	$3^2 4^2$	0	$2^{10} 4^2$	0	6^2	$1^6 1^6 2^2$
190	6^2	6^2	2^2	0	0	$2^2 4^2$	$1^2 1^6$	0	2^6	4^2

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Cor. 1.2, 1.3, 1.4
(1.1), (1.2)

2.
Lem. 2.1, 2.2
(F1) – (F4)
Figure 1 (a)-(c)
(P), (Q)
(2.1)
Figure 2

3.
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(3.1)

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Def. 4.2
Rem. 4.3
Table 1

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Index

About the author(s), **22**, 23
abstract, **15**, 17
  footnotes within, 18
  JAMS, exception, 19
  references within, 17
Acknowledgment(s), **22**, 23
acronyms, 83–84
  consistent use, 83
  key words as, 83
  plurals spelled with "s", 83
  spell out at first use, 83
`addmr`, 63
affiliations, **22**, 25
AMS Journal Article Checklist and Style Sheet, **6**
  checklist portion, 7
  numbering systems portion, 7, 8, 29
  style sheet portion, 7, 8
AMS journal papers
  author prepared, 5
  LaTeX, 5
AMS production system
  online, 5
  print, 5
appendices, 61–62
  callouts, 62
  form, 61
  heading styles, 61
  location, 61
  long tables, 61
  numbering styles, 61
article contents, 19
authors, **15**, 16

basic editing, 74–75
bias-free language, 95
blackboard bold, 76, **139**
British spelling, 74, 142

calligraphic type, 76, **139**
callouts
  figures, 9, 75, 82
  tables, 9, 75, 82
capitalization
  in lists, 79–80
  numbered enunciations, 81
  proper nouns, 79, 81
  sentence style, 27, 28, 46, 54, 79, 90
cases
  conditions, 109
citation style
  alphanumeric, 8, 66
  name and year, 8, 66
  numbered, 8, 66
  wide, 8, 66
communicating editor, **15**, 17
contributors, 17
copy editor's responsibility for
  figures, 45
  references, 63
  tables, 53
copycheck, 64
copyediting
  elementary rules, 72
  rules for the AMS, 72
copyright information, **15**, 21

corrigenda, 67–68
  abstract, 67, 68
  mathematical, 67
  MSN numbers, 67, 68
  received date, 67, 68
  references to original article, 68
  running head, 68
  title, 68
Cyrillic, 75, 78, **140**

dedication, **15**, 17
dingbats, definition, 3
  ✘, 3
  ✓, 3
  ok, 3
downstream processing, 4, 72, 82
  abstract, 17, 18, 68
  authors, 16
  figure callouts, 9, 45
  lists, 41
  table callouts, 9, 53
  title, 16, 68

email address, **22**, 26
end matter, 15, 21–26
  About the author(s)
    BAMS, exception, 23
  Acknowledgment(s), 23
  affiliations, 25
  elements, **22**
  email address, 26
  Note added in proof, 24
  references, 25
  translator, 26
  URL, 26
English as a second language (ESL), 74, 96
enunciations, 31–35
  algorithm as computer code, **35**
  algorithm as theorem style, **35**
  as proper nouns, 81
  capitalization, 81
  definition style, **33**
  numbered, 31
  proof style, **32**
  remark style, **33**
  spell out full name, 81
  theorem style, **31**
  unnumbered, 31
  variants for algorithms, 34
  with parenthetical text, 34
  with proofs, 34

equations
  alignment, 116–119
  breaking in displays, 116–119
    align on operators (verbs), 117
    alignment, 117
    before an operator, 116
errata, 67–68
  online, 67
  publication, 67

figures, 45–52
  callouts, 48, 75, 82
  captions, 46
    end punctuation, 46
    permission statements within, 47
    position, 9, 46
    sentence style, 46
    style, 46
  copy editor's responsibility for, 45, 47
  landscape, 46, 49, **52**
  multiple parts, 46, **49**
  not mathematical displays, 46
  numbering, 45–46
  periods in captions, 84
  permissions, 47
  placement, 48
    numbered, 48
    unnumbered, 48
  sizing, 48–49
fonts
  Computer Modern (CM), 4
  STIX, 4
footnotes, 37–38
  mathematics within, 38
  references within, 38
  within mathematics, 38
fractions
  case, 107, 108
  display style, 108
  slashed, 107, 108
  stacked, 107, 108
  text style, 108
functions and operators, **123, 124**
  set in italic type, 78
  set in roman type, 78, **123**
    in math, 78
    in text, 78

gender-neutral language, 95
German (fraktur), 75, 76, **139**

grant support information, **15**, 20
Greek, 75, 78, **140**

Hebrew, 75, 78, **140**
hyphenated compounds
  math-specific terms, **135**

italics
  at first use of a term, 77
  for emphasis, 77
  for mathematical variables, 76
  parentheses, 77
  text in enunciations, 31

journal papers
  accepted manuscript, 8
  AMS output, 8

key words and phrases, 20

LaTeX
  copy editor's job made easier by, 5
  spacing in displays
    LaTeX will adjust, 113, 114
linking
  numbered enunciations, 31, 73
  numbered figures, 73, 75
  numbered tables, 73, 75
  reference citations, 73, 75
lists, 39–44
  examples of, 42–44
  in-text callouts to, 41
  item identifiers, 39
    within enumerate environment, 39
    within itemize environment, 39
  numbering, 39–41
  parallel construction, 40, 79
  problem for downstream processing, 41
  punctuation and capitalization, 41, 79
  style, 40
logo, **15**, 15

manuscript package, 7
mathematical corrigendum, 67
mathematical expressions
  functions and operators, 98–100
    abbreviated forms, 98–100
    as subscripts and superscripts, 99
    capitalization, 98
    functions, 98–100
    set roman, 98
    sometimes italic, 99
    thin space after, 99
Mathematical Reviews (MR), 63
mathematical symbols, 75
  as parts of speech, **75**
mathematics editing, 97–119
  breaking equations
    in displays, 116–119
    in logic, 116
    in text, 114–116
  cases, 109–110
  centered dots ($\cdots$), 102–103
  conditions, 109
  diagrams, 111–112
  direct sum ($\oplus$, $\bigoplus$), 105
  equation numbers, 112
    vertical placement, 112
  fences, 103–104
    angle brackets, 103
    braces, 103
    brackets, 103
    double bars, 103
    in combinations, 103
    parentheses, 103
    single bar, 103
  fractions, 107–109
    case, 107, 108
    display style, 108
    slashed, 107, 108
    stacked, 107, 108
    text style, 108
  functions and operators, 98–100
  integrals ($\int$), 106–107
  intersections ($\cap$, $\bigcap$), 105–106
  line dots ($\ldots$), 102–103
  matrices, 110
  numbers, 97–98
    10 and over, 97
    roman numerals, 98
    single digit, 97
  products ($\prod$), 104–105
  punctuation, 100–102
    colons, 102
    conditions, 100
    elided lists, 100
    with "for all" ($\forall$), 100
    with left- or right-braced equations, 101
    with nonrestrictive phrases, 100
  spacing in displays, 113–114
    LaTeX will adjust, 113
  sums ($\sum$), 104–105

tensor product ($\otimes$, $\bigotimes$), 105
unions ($\cup$, $\bigcup$), 105–106
variables, 98, **139, 140**
wedge product ($\wedge$, $\bigwedge$), 105
wedge sum ($\vee$, $\bigvee$), 105
Mathematics Subject Classification, **15**, 19

Note added in proof, 24
numbered enunciations, 8
numbering system
anomalies, 8
assessment, 8

open punctuation, 11

`pageref`, 75
paging
bad line breaks, 10
short or long pages, 10
parallel construction, 40, 79, 83
parentheses
within italic text, 77
part title or other supersection heads, 29
publication erratum, 67
punctuation, 84–95
apostrophe, 94
for possessive form of names ending in "s", 94
plurals of variables, 94
colon
before lists, 87
capitalization after, 87
capitalization after in titles, 90
with "following", 88
comma
open style, 11, 84
parenthetical, 84
serial, 84
splice, 84
when to add, 84–86
when to delete, 86
with conditions, 109
em dash, 93–94
a colon with *flair*, 93
for emphasis, 93
for parenthetical elements, 94
en dash, 93
in multiword compound modifiers, 93
ranges, 93
with author names, 93
hyphen, 91–92
in "th" constructions, 92
in mathematical terms, 91
in prefixes, 91
in suffixes, 91
in word pairs indicating opposition, 91
when to avoid, 92
periods
in abbreviated hyphenated names, 84
in captions, 84
quotation marks, 94–95
direct quotes, 94
double quotation marks, 94
logical, not newspaper, style, 95
scare quotes, 94
single quotation marks, 95
vs. italics, 95
semicolon
in lists, 80, 84, 87
splice, 86
with conjunctions, 85
with independent clauses, 87

QED box, 32
queries, 7, 10
AMS query, 7
Author query, 7
how to phrase, 10
when it is necessary, 10
quotations, 95
block, 95
in text, 95

received and revised dates, **15**, 19
references, **22**, 25, 63–66
3-em line, 64
alphanumeric forms, 8, 66
arXiv works, 64
author's original, 63
citation styles, 8
alphanumeric abbreviation, 8
name and year, 8
numbered, 8
citations, 66
copy editor's responsibility for, 63
copycheck, 64
follow MR style, 64
in abstract, 17
MathSciNet (MSN), 63

MR number, 64
MSN substitutions, 63
known problems, 64
name and year forms, 8, 66
numbered forms, 8, 66
personal communication, 64
wide forms, 8, 66
with DOI number, 65
running heads, 15, 21

script, 76, **139**
§ (section sign)
allowable usage, 30, 81
"section"
lowercase, 30, 81
spell out, 30, 81
section head, 27–30
AMS style, 29
callouts in text, 30
capitalization, 27
letters, 30
numbered "0", 30
numbering, 29–30
parenthetical information within, 28
punctuation, 27
references within, 28
roman numerals in, 30
styles, 27–29
unnumbered, 30
slant type, **76**
subsection head, 27–30
AMS style, 29
callouts in text, 30
parenthetical information within, 28
punctuation, 28
subsubsection head
AMS style, 29
symbols
direct sum ($\oplus$, $\bigoplus$), 105
integrals ($\int$), 75, 106
in display, 106
in text, 106
intersections ($\cap$, $\bigcap$), 105–106
products ($\prod$), 75, 104
in display, 104
in text, 104
sums ($\sum$), 75, 104
in display, 104
in text, 104
table of easily confused, 105
tensor product ($\otimes$, $\bigotimes$), 105
unions ($\cup$, $\bigcup$), 105–106
wedge product ($\wedge$, $\bigwedge$), 105
wedge sum ($\vee$, $\bigvee$), 105

tables, 53–60
callouts, 53, 55, 75, 82
captions, 54–55
end punctuation, 55
permissions statements within, 55
position, 9, 54
sentence style, 54
style, 54
copy editor's responsibility for, 53
landscape, 56, **60**
misnumbered as a figure, 54
multiple parts, **58**
numbering, 54
periods in captions, 84
permissions, 55
placement, 55
numbered, 56
unnumbered, 56
sizing, 56
text block, 3–4
AMS primary journals, 3
Russian translation journals, 4
text dependent style, 77
abbreviations, 78, 80
English terms, 80
Latin words, 78, 80
title, **15**, 15
top matter, 15–21
abstract, **15**, 17
article contents, 19
authors, **15**, 16
in running heads, 16, 21
styling names, 16
communicating editor, **15**
PAMS, exception, 17
contributors, 17
copyright information, **15**, 21
dedication, **15**, 17
elements, **14**
grant support information, **15**, 20
key words and phrases, 20
logo, **15**, 15
Mathematics Subject Classification, **15**, 19
received and revised dates, **15**, 19
title, **15**, 15
in running heads, 21
shortening for running heads, 21
translator, 26

type, 76–79
  blackboard bold, 76, **139**
  bold, 76
  calligraphic type, 76, **139**
  Cyrillic, 78, **140**
  for emphasis
    in italic text, 78
    in roman text, 78
  German (fraktur), 76, **139**
  Greek, 78, **140**
  Hebrew, 78, **140**
  italics, 76
  roman, 77
  script, 76, **139**
  slant, **76**

URL, **22**, 26, 53

variables, 98, **139, 140**
  blackboard bold, 98
  bold italic, 98
  bold roman, 98
  calligraphic type, 98
  German (fraktur), 98
  italic, 98
  roman, 98

wording, 80–83
  "if/then" constructions, 82
  "let/be" statements, 82
  use of "above", 82
  use of "below", 82
  use of "for all" (∀), 81, 99–101
  use of "that" vs. "which", 82
  use of "the sequel", 82
  use of "there exists" (∃), 81, 99
  use proper parallelization, 83
  well-behaved, 80, 135
  well-defined, 80, 135
  well-order, 80, 135
  well-posed, 80, 135
  what to avoid at start of sentence, 80

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