CONTENTS

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

A. Jaikin-Zapirain, Centralizer sizes and nilpotency class in Lie algebras and finite $p$-groups .......................................................... 2817
A. Díaz-Cano, Orderings and maximal ideals of rings of analytic functions .... 2821
Bruce Reznick, On the absence of uniform denominators in Hilbert’s 17th problem 2829
Frank Sottile and Thorsten Theobald, Real $k$-flats tangent to quadrics in $\mathbb{R}^n$ 2835
Gabriel Navarro and Geoffrey R. Robinson, Blocks with $p$-power character degrees .......................................................... 2845
Dragomir Ž. Đoković and Fernando Szechtman, Characterization of bilinear spaces with unimodular isometry group .................................. 2853
Huah Chu, Shou-Jen Hu, and Ming-chang Kang, A variant of the Reynolds operator .......................................................... 2865
Siman Wong, Densities of quartic fields with even Galois groups ............ 2873
Yoonjín Lee and Allison M. Pacelli, Class groups of imaginary function fields: The inert case .......................................................... 2883
Brandt Kronholm, On congruence properties of $p(n, m)$ ......................... 2891
Kent E. Morrison, The polynomial analogue of a theorem of Rényi .......... 2897
Robert Osburn, A remark on a conjecture of Borwein and Choi ............. 2903
Alexander Wilce, Compact orthoalgebras ........................................... 2911
Zeng Guangxing, Ordered fields satisfying Pólya’s theorem .................... 2921
Angel V. Kumchev, On the Waring–Goldbach problem for seventh powers .... 2927

B. ANALYSIS

Lionel Thibault and Nadia Zlateva, Integrability of subdifferentials of directionally Lipschitz functions ............................................. 2939
S. Dutta, Generalized subdifferential of the distance function .................. 2949
Monique Laurent, Revisiting two theorems of Curto and Fialkow on moment matrices .......................................................... 2965
Xiaohong Cao, Maozheng Guo, and Bin Meng, A note on Weyl’s theorem . 2977
Guangsheng Wei and Yaolin Jiang, A characterization of positive self-adjoint extensions and its application to ordinary differential operators 2985
V. Müller, Power bounded operators and supercyclic vectors II ................ 2997
Yongzhong Huang and Quan Zheng, Regularization for a class of ill-posed Cauchy problems .......................................................... 3005
C. Benhida, E. H. Zerouali, and H. Zguitti, Spectra of upper triangular operator matrices .......................................................... 3013
Máté Matolcsi, Fuglede’s conjecture fails in dimension 4 ......................... 3021
Francesc Mañosas and Pedro J. Torres, Isochronicity of a class of piecewise continuous oscillators ............................................. 3027
T. Domínguez Benavides and María A. Japón Pineda, Fixed points of nonexpansive mappings in spaces of continuous functions ....... 3037
Stephan Ramon Garcia, The backward shift on Dirichlet-type spaces ......... 3047
Masaharu Tanabe, Bounds on the number of holomorphic maps of compact Riemann surfaces .......................................................... 3057
Hong-Ke Du and Chun-Yuan Deng, *A new characterization of gaps between two subspaces* ................................................................. 3065

Pavel Kurasov and Andrea Posilicano, *Finite speed of propagation and local boundary conditions for wave equations with point interactions* .............. 3071

Wen-An Yong, *A note on the zero Mach number limit of compressible Euler equations* ................................................................. 3079

Bin Meng, Maozheng Guo, and Xiaohong Cao, *Operator-valued free Fisher information and modular frames* ................................................. 3087

**D. GEOMETRY**

B. Requejo and Juan B. Sancho, *A characterization of the projective line* ... 3097

**E. LOGIC AND FOUNDATIONS**

Arthur W. Apter and Grigor Sargsyan, *Can a large cardinal be forced from a condition implying its negation?* ................................................. 3103

**G. TOPOLOGY**

Janez Mrčun, *On isomorphisms of algebras of smooth functions* ................. 3109

Peter Milley, *Line arrangements in $\mathbb{H}^3$* ............................................ 3115
Editorial Information

To be published in the *Proceedings*, a paper must be correct, new, nontrivial, and significant. Further, it must be well written and of interest to a substantial number of mathematicians. Piecemeal results, such as an inconclusive step toward an unproved major theorem or a minor variation on a known result, are in general not acceptable for publication. *Proceedings* Editors solicit and encourage publication of worthy papers of length not exceeding 10 published pages. Published pages are the same size as those generated in the style files provided for \texttt{AMSLATEX} or \texttt{AMSTEX}.

Information on the backlog for this journal can be found on the AMS website starting from http://www.ams.org/proc.

In an effort to make articles available as quickly as possible, articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

A Consent to Publish and Copyright Agreement is required before a paper will be published in this journal. After a paper is accepted for publication, the Providence office will send out a Consent to Publish and Copyright Agreement to all authors of the paper. By submitting a paper to this journal, authors certify that the results have not been submitted to nor are they under consideration for publication by another journal, conference proceedings, or similar publication.

Information for Authors

**Initial submission.** Two copies of the paper should be sent directly to the appropriate Editor and the author should keep a copy.

**IF an editor is agreeable,** an electronic manuscript prepared in \texttt{LATEX} or \texttt{LATEX} may be submitted by pointing to an appropriate URL on a preprint or e-print server.

The first page of an article must consist of a *descriptive title*, followed by an *abstract* that summarizes the article in language suitable for workers in the general field (algebra, analysis, etc.). The *descriptive title* should be short, but informative; useless or vague phrases such as “some remarks about” or “concerning” should be avoided. The *abstract* should be at least one complete sentence, and at most 150 words. Included with the footnotes to the paper should be the 2000 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. The classifications are accessible from www.ams.org/msc/. The list of classifications is also available in print starting with the 1999 annual index of *Mathematical Reviews*. The Mathematics Subject Classification footnote may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. Journal abbreviations used in bibliographies are listed in the latest *Mathematical Reviews* annual index. The series abbreviations are also accessible from www.ams.org/publications/. To help in preparing and verifying references, the AMS offers MR Lookup, a Reference Tool for Linking, at www.ams.org/mrlookup/. When the manuscript is submitted, authors should supply the editor with electronic addresses if available. These will be printed after the postal address at the end of each article.

**Electronically prepared manuscripts.** The AMS encourages electronically prepared manuscripts, with a strong preference for \texttt{AMSLATEX}. To this end, the Society has prepared \texttt{AMSLATEX} author packages for each AMS publication. Author packages include instructions for preparing electronic manuscripts, the *AMS Author Handbook*, samples, and a style file that generates the particular design specifications of that publication series. Articles properly prepared using the \texttt{AMSLATEX} style file and the \texttt{\label} and \texttt{\ref} commands automatically enable extensive intra-document linking to the bibliography and other elements of the article for searching electronically on the Web. Because linking must often be added manually to electronically prepared manuscripts in other forms of \texttt{LATEX}, using \texttt{AMSLATEX} also reduces the amount of technical intervention once the files are received by the AMS. This results in fewer errors in processing and saves the author proofreading time. \texttt{AMSLATEX} papers also move more efficiently through the production stream, helping to minimize publishing costs.
AMS-\LaTeX{} is the highly preferred format of \TeX{}, but author packages are also available in AMS-\TeX{}. Those authors who make use of these style files from the beginning of the writing process will further reduce their own efforts. Manuscripts prepared electronically in \LaTeX{} or plain \TeX{} are normally not acceptable due to the high amount of technical time required to ensure that the file will run properly through the AMS in-house production system. \LaTeX{} users will find that AMS-\LaTeX{} is the same as \LaTeX{} with additional commands to simplify the typesetting of mathematics, and users of plain \TeX{} should have the foundation for learning AMS-\LaTeX{}.

Authors may retrieve an author package from the AMS website starting from www.ams.org/tex/ or via FTP to ftp.ams.org (login as anonymous, enter username as password, and type cd pub/author-info). The AMS Author Handbook and the Instruction Manual are available in PDF format following the author packages link from www.ams.org/tex/. The author package can also be obtained free of charge by sending email to pub@ams.org (Internet) or from the Publication Division, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When requesting an author package, please specify AMS-\LaTeX{} or AMS-\TeX{}, Macintosh or IBM (3.5) format, and the publication in which your paper will appear. Please be sure to include your complete mailing address.

At the time of submission, authors should indicate if the paper has been prepared using AMS-\LaTeX{} or AMS-\TeX{} and provide the Editor with a paper manuscript that matches the electronic manuscript. The final version of the electronic manuscript should be sent to the Providence office immediately after the paper has been accepted for publication. The author should also send the final version of the paper manuscript to the Editor, who will forward a copy to the Providence office. Editors will require authors to send their electronically prepared manuscripts to the Providence office in a timely fashion. Electronically prepared manuscripts can be submitted via the web at www.ams.org/submit-book-journal/, sent via email to pub-submit@ams.org (Internet), or sent on diskette to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When sending a manuscript electronically via e-mail or diskette, please be sure to include a message indicating in which publication the paper has been accepted. No corrections will be accepted electronically. Authors must mark their changes on their proof copies and return them to the Providence office. Complete instructions on how to send files are included in the author package.

Electronic graphics. Comprehensive instructions on preparing graphics are available starting from www.ams.org/jourhtml/authors.html. A few of the major requirements are given here.

Submit files for graphics as EPS (Encapsulated PostScript) files. This includes graphics originated via a graphics application as well as scanned photographs or other computer-generated images. If this is not possible, TIFF files are acceptable as long as they can be opened in Adobe Photoshop or Illustrator. No matter what method was used to produce the graphic, it is necessary to provide a paper copy to the AMS.

Authors using graphics packages for the creation of electronic art should also avoid the use of any lines thinner than 0.5 points in width. Many graphics packages allow the user to specify a “hairline” for a very thin line. Hairlines often look acceptable when proofed on a typical laser printer. However, when produced on a high-resolution laser imagesetter, hairlines become nearly invisible and will be lost entirely in the final printing process.

Screens should be set to values between 15% and 85%. Screens which fall outside of this range are too light or too dark to print correctly. Variations of screens within a graphic should be no less than 10%.

AMS policy on making changes to articles after posting. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue. To preserve the integrity of electronically published articles, once an article is individually posted to the AMS website but not yet in an issue, changes cannot be made in place in the paper. However, an “Added after posting” section may be added to the paper right before the References when there is a critical error in the content of the paper.
The “Added after posting” section gives the author an opportunity to correct this type of critical error before the article is put into an issue for printing and before it is then reposted with the issue. The “Added after posting” section remains a permanent part of the paper. The AMS does not keep author-related information, such as affiliation, current address, and email address, up to date after a paper is initially posted.

Once the article is assigned to an issue, even if the issue has not yet been posted to the AMS website, corrections may be made to the paper by submitting a traditional errata article to the Editor. The errata article will appear in a future print issue and will link back and forth on the web to the original article online.

**Secure manuscript tracking on the Web and via email.** Authors can track their manuscripts through the AMS journal production process using the personal AMS ID and Article ID printed in the upper right-hand corner of the Consent to Publish form sent to each author who publishes in AMS journals. Access to the tracking system is available from [www.ams.org/mstrack/](http://www.ams.org/mstrack/) or via email sent to mstrack-query@ams.org. To access by email, on the subject line of the message simply enter the AMS ID and Article ID. To track more than one manuscript by email, choose one of the Article IDs and enter the AMS ID and the Article ID followed by the word *all* on the subject line. An explanation of each production step is provided on the web through links from the manuscript tracking screen. Questions can be sent to proc-query@ams.org.

**\TeX** files available. Beginning with the January 1992 issue of the *Bulletin* and the January 1996 issues of *Transactions, Proceedings, Mathematics of Computation*, and the *Journal of the AMS*, \TeX files can be downloaded from the AMS website, starting from [www.ams.org/journals/](http://www.ams.org/journals/). Authors without Web access may request their files at the address given below after the article has been published. For *Bulletin* papers published in 1987 through 1991 and for *Transactions, Proceedings, Mathematics of Computation*, and the *Journal of the AMS* papers published in 1987 through 1995, \TeX files are available upon request for authors without Web access by sending email to file-request@ams.org or by contacting the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. The request should include the title of the paper, the name(s) of the author(s), the name of the publication in which the paper has or will appear, and the volume and issue numbers if known. The \TeX file will be sent to the author making the request after the article goes to the printer. If the requestor can receive Internet email, please include the email address to which the file should be sent. Otherwise please indicate a diskette format and postal address to which a disk should be mailed. **Note:** Because \TeX production at the AMS sometimes requires extra fonts and macros that are not yet publicly available, \TeX files cannot be guaranteed to run through the author’s version of \TeX without errors. The AMS regrets that it cannot provide support to eliminate such errors in the author’s \TeX environment.

**Inquiries.** Any inquiries concerning a paper that has been accepted for publication that cannot be answered via the manuscript tracking system mentioned above should be sent to proc-query@ams.org or directly to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.
Authors are requested to send papers directly to the appropriate Editor (the one whose area of responsibility and expertise, as described below, most closely approximates the subject field of the manuscript). Only when in doubt about an appropriate Editor, should manuscripts be sent to the Coordinating Editor responsible for the area in mathematics most closely connected to the paper. If in doubt about the area, send the manuscript to the Managing Editor, to whom all other communication about the journal should also be addressed. (All addresses should include the line “Department of Mathematics”, unless another department is indicated.)

Managing Editor: Eric Bedford, Indiana University, Bloomington, IN 47405-5701 USA; e-mail: bedford@indiana.edu

1. ODE, PDE, GLOBAL ANALYSIS, AND DYNAMICAL SYSTEMS
   Coordinating Editor: Linda Keen, CUNY-Lehman College, Bronx, NY 10468 USA; e-mail: linda.keen@lehman.cuny.edu
   Dynamical systems and ergodic theory, Michael Handel, Department of Mathematics and Computer Science, Herbert Lehman College (CUNY), Bronx, NY 10468-1589 USA; e-mail: michael@alpha.lehman.cuny.edu
   Global analysis, Mikhail Shubin, Northeastern University, Boston, MA 02115 USA; e-mail: shubin@neu.edu
   Ordinary differential equations and special functions, Carmen C. Chicone, University of Missouri, Columbia, MO 65211-0001 USA; e-mail: carmen@chicone.math.missouri.edu
   Partial differential equations, David S. Tartakoff, University of Illinois at Chicago, Chicago, IL 60607 USA; e-mail: dst@uic.edu

2. LIE GROUPS, TOPOLOGY, AND GEOMETRY
   Coordinating Editor: Ronald A. Fintushel, Michigan State University, East Lansing, MI 48824-1027 USA; e-mail: ronfint@math.msu.edu
   Algebraic topology, Paul Goerss, Northwestern University, Evanston, IL 60208-2730 USA; e-mail: pgoerss@math.northwestern.edu
   Differential geometry (Riemannian, symplectic, contact, Kähler, and complex geometries), Jon G. Wolfson, Michigan State University, East Lansing, MI 48824-1027 USA; e-mail: wolfson@math.msu.edu
   Geometric analysis (geometric PDE, minimal surfaces, and harmonic maps), Richard A. Wentworth, Johns Hopkins University, Baltimore, MD 21218 USA; e-mail: wentworth@jhu.edu
   Low dimensional topology, gauge theory, 4-manifolds, Ronald A. Fintushel
   Geometric topology, Alexander N. Dranishnikov, University of Florida, 358 Little Hall, Gainesville, FL 32611-8105 USA; e-mail: dranish@math.ufl.edu

3. ANALYSIS AND OPERATOR THEORY
   Coordinating Editor: Andreas Seeger, University of Wisconsin, Madison, WI 53706 USA; e-mail: seeger@math.wisc.edu
   Banach spaces and linear functional analysis, N. Tomczak-Jaegermann, University of Alberta, Edmonton, AB, Canada T6G 2G1; e-mail: ntomczak@ualberta.ca; nicole.tomczak@ualberta.ca
   Geometric measure theory and classical real analysis, David Preiss, University College London, Gower Street, London WC1E 6BT, United Kingdom; e-mail: dp@math.ucl.ac.uk
   Harmonic analysis, Michael T. Lacey, School of Mathematics, Georgia Institute of Technology, 686 Cherry Street NW, Atlanta, GA 30332-4301 USA; e-mail: lacey@math.gatech.edu
Linear and nonlinear functional analysis, Jonathan M. Borwein, Faculty of Computer Science, Dalhousie University, 6050 University Avenue, Halifax, Nova Scotia B3H 1W5 Canada; e-mail: jborwein@cs.dal.ca

One complex variable and potential theory, Juha M. Heinonen, University of Michigan, Ann Arbor, MI 48109-1109 USA; e-mail: PAMS1@umich.edu

Operator theory, Joseph A. Ball, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 USA; e-mail: ball@math.vt.edu

Several complex variables, Mei-Chi Shaw, University of Notre Dame, Notre Dame, IN 46556-0398 USA; e-mail: mei-chi.shaw.1@nd.edu

4. ALGEBRA, NUMBER THEORY, COMBINATORICS, AND LOGIC
Coordinating Editor: Lance W. Small, University of California San Diego, La Jolla, CA 92093-0112 USA; e-mail: lwsmall@ucsd.edu

Algebraic geometry, Michael Stillman, Cornell University, Malott Hall, Ithaca, NY 14853-4201 USA; e-mail: mike@math.cornell.edu

Automorphic forms, number theory, and applications of number theory, Wen-Ching Winnie Li, Pennsylvania State University, University Park, PA 16802-6401 USA; e-mail: wli@math.psu.edu

Combinatorics, John R. Stembridge, University of Michigan, Ann Arbor, MI 48109-1109 USA; e-mail: jrs@umich.edu

Commutative algebra, Bernd Ulrich, Purdue University, West Lafayette, IN 47907-1395 USA; e-mail: ulrich@math.purdue.edu

General number theory, David E. Rohrlich, Boston University, Boston, MA 02215-2411 USA; e-mail: rohrlich@math.bu.edu

Group theory, Jonathan I. Hall, Michigan State University, East Lansing, MI 48824-1027 USA; e-mail: jhall@math.msu.edu

Lie algebras, Dan M. Barbasch, Cornell University, Malott Hall, Ithaca, NY 14853-4201 USA; e-mail: barbasch@math.cornell.edu

Logic and foundations, Julia Knight, University of Notre Dame, 255 Hurley, Notre Dame, IN 46556-4618 USA; e-mail: knight.1@nd.edu

Noncommutative rings, Martin Lorenz, Temple University, Philadelphia, PA 19122-6094 USA; e-mail: lorenz@math.temple.edu

5. APPLIED MATHEMATICS, PROBABILITY, AND STATISTICS
Coordinating Editor: Mark J. Ablowitz, Department of Applied Mathematics, Campus Box 526, University of Colorado, Boulder, CO 80309-0526 USA; e-mail: markjab@newton.colorado.edu

Applied probability and statistics, Edward C. Waymire, Oregon State University, Corvallis, OR 97331-4605 USA; e-mail: waymire@math.orst.edu

Differential equations, Michael I. Weinstein, Department of Applied Physics and Applied Mathematics, Columbia University, 200 S.W. Mudd MC 4701, New York, NY 10027 USA; e-mail: miw2103@columbia.edu

Partial differential equations and dynamical systems, Walter Craig, Department of Mathematics and Statistics, McMaster University, Hamilton, Ontario, L8S 4K1 Canada; e-mail: craig@math.mcmaster.ca

Probability, Richard C. Bradley, Indiana University, Bloomington, IN 47405-4301 USA; e-mail: bradleyr@indiana.edu
T. Domínguez Benavides and María A. Japón Pineda, Fixed points of nonexpansive mappings in spaces of continuous functions .......................... 3037
Stephan Ramon García, The backward shift on Dirichlet-type spaces ............ 3047
Masaharu Tanabe, Bounds on the number of holomorphic maps of compact Riemann surfaces ......................................................... 3057
Hong-Ke Du and Chun-Yuan Deng, A new characterization of gaps between two subspaces ................................................................. 3065
Pavel Kurasov and Andrea Posilicano, Finite speed of propagation and local boundary conditions for wave equations with point interactions .................. 3071
Wen-An Yong, A note on the zero Mach number limit of compressible Euler equations ................................................................. 3079
Bin Meng, Maozheng Guo, and Xiaohong Cao, Operator-valued free Fisher information and modular frames ........................................... 3087

D. GEOMETRY

B. Requejo and Juan B. Sancho, A characterization of the projective line ... 3097

E. LOGIC AND FOUNDATIONS

Arthur W. Apter and Grigor Sargsyan, Can a large cardinal be forced from a condition implying its negation? ........................................ 3103

G. TOPOLOGY

Janez Mrčun, On isomorphisms of algebras of smooth functions .................. 3109
Peter Milley, Line arrangements in \( \mathbb{H}^3 \) ........................................ 3115
A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

A. Jaikin-Zapirain, Centralizer sizes and nilpotency class in Lie algebras and finite p-groups ................................................. 2817

A. Díaz-Cano, Orderings and maximal ideals of rings of analytic functions ..... 2821
Bruce Reznick, On the absence of uniform denominators in Hilbert’s 17th problem ................................................................. 2829

Frank Sottile and Thorsten Theobald, Real k-flats tangent to quadrics in \( \mathbb{R}^n \) .............................................................. 2835

Gabriel Navarro and Geoffrey R. Robinson, Blocks with p-power character degrees .............................................................. 2845

Dragomir Ž. Đoković and Fernando Szechtman, Characterization of bilinear spaces with unimodular isometry group .................... 2853

Huah Chu, Shou-Jen Hu, and Ming-chang Kang, A variant of the Reynolds operator ................................................................. 2865

Siman Wong, Densities of quartic fields with even Galois groups .......... 2873

Yoonjin Lee and Allison M. Pacelli, Class groups of imaginary function fields: The inert case ....................................................... 2883

Brandt Kronholm, On congruence properties of \( p(n,m) \) .................... 2891

Kent E. Morrison, The polynomial analogue of a theorem of Rényi .......... 2897

Robert Osburn, A remark on a conjecture of Borwein and Choi ............ 2903

Alexander Wilce, Compact orthoalgebras ........................................ 2911

Zeng Guangxing, Ordered fields satisfying Pólya’s theorem ................. 2921

Angel V. Kumchev, On the Waring–Goldbach problem for seventh powers . 2927

B. ANALYSIS

Lionel Thibault and Nadia Zlateva, Integrability of subdifferentials of directionally Lipschitz functions ........................................ 2939

S. Dutta, Generalized subdifferential of the distance function .......... 2949


Monique Laurent, Revisiting two theorems of Curto and Fialkow on moment matrices ............................................................. 2965

Xiaohong Cao, Maozheng Guo, and Bin Meng, A note on Weyl’s theorem ................................................................. 2977

Guangsheng Wei and Yaolin Jiang, A characterization of positive self-adjoint extensions and its application to ordinary differential operators .......... 2985

V. Müller, Power bounded operators and supercyclic vectors II ............ 2997

Yongzhong Huang and Quan Zheng, Regularization for a class of ill-posed Cauchy problems .................................................... 3005

C. Benhida, E. H. Zerouali, and H. Zguitti, Spectra of upper triangular operator matrices .................................................. 3013

(Continued on inside back cover)