VOLUME 64 NUMBER 210 APRIL 1995

MATHEMATICS OF COMPUTATION

AMERICAN MATHEMATICAL SOCIETY

EDITED BY

James H. Bramble
Susanne C. Brenner
E. W. Cheney
Howard Elman
Walter Gautschi, *Managing Editor*
Eugene Isaacson
James N. Lyness
Harald Niederreiter
Syvert P. Nørsett
Andrew M. Odlyzko
Frank W. J. Olver
John E. Osborn
Stanley Osher
Carl Pomerance
René Schoof
L. Ridgway Scott
Daniel Shanks
Chi-Wang Shu
Frank Stenger
Hans J. Stetter
G. W. Stewart
Nico M. Temme
Vidar Thomée
Lars B. Wahlbin
Hugh C. Williams
John W. Wrench, Jr.

PROVIDENCE, RHODE ISLAND USA

ISSN 0025-5718

Mathematics of Computation

This journal publishes research articles in computational mathematics. Areas covered include numerical analysis, the application of computational methods, algorithms for advanced computer architectures, computational number theory and algebra, and related fields. Table errata and reviews of books in areas related to computational mathematics are also included.

Subscription information. *Mathematics of Computation* is published quarterly. Subscription prices for Volume 64 (1995) are $274 list; $219 institutional member; $178 member of CBMS organizations; $164 individual AMS member. A late charge of 10% of the subscription price will be imposed upon orders received from nonmember institutions and organizations after January 1 of the subscription year. Subscribers outside the United States and India must pay a postage surcharge of $9; subscribers in India must pay a postage surcharge of $18. Expedited delivery to destinations in North America $13; elsewhere $40.

Back number information. For back issues see the *AMS Catalog of Publications.*

Subscriptions and orders should be addressed to the American Mathematical Society, P. O. Box 5904, Boston, MA 02206-5904. *All orders must be accompanied by payment.* Other correspondence should be addressed to P. O. Box 6248, Providence, RI 02940-6248.

Unpublished Mathematical Tables. The editorial office of the journal maintains a repository of Unpublished Mathematical Tables (UMT). When a table is deposited in the UMT repository a brief summary of its contents is published in the section *Reviews and Descriptions of Tables and Books.* Upon request, the chairman of the editorial committee will supply copies of any table for a nominal cost per page. All tables and correspondence concerning the UMT should be sent to Walter Gautschi, Chairman, Editorial Committee, Mathematics of Computation, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907.

Copying and reprinting. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Manager of Editorial Services, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248. Requests can also be made by e-mail to `reprint-permission@math.ams.org`.

The appearance of the code on the first page of an article in this journal indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that the fee of $1.00 plus $.25 per page for each copy be paid directly to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Mathematics of Computation is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2213. Second-class postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Mathematics of Computation, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248.

© Copyright 1995 by the American Mathematical Society. All rights reserved.
Printed in the United States of America.
⊗ The paper used in this book is acid-free and falls within the guidelines established to ensure permanence and durability.
♻ Printed on recycled paper.
This publication was typeset using $\mathcal{AMS}$-TEX,
the American Mathematical Society's TEX macro system.
10 9 8 7 6 5 4 3 2 1 00 99 98 97 96 95

Editorial Information

As of February 1, 1995, the backlog for this journal was approximately 1 issue. This estimate is the result of dividing the number of manuscripts for this journal in the Providence office that have not yet gone to the printer on the above date by the average number of articles per issue over the previous twelve months, reduced by the number of issues published in six months (the time necessary for editing and composing a typical issue).

A Copyright Transfer Agreement is required before a paper will be published in this journal. By submitting a paper to this journal, authors certify that the manuscript has not been submitted to nor is it under consideration for publication by another journal, conference proceedings, or similar publication.

Information for Authors and Editors

The first page 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* must be brief and reasonably self-contained. Included with the footnotes to the paper, there should be the 1991 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. This may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. A list of the numbers may be found in the annual index of *Mathematical Reviews*, published with the December issue starting in 1990, as well as from the electronic service e-MATH [**telnet e-MATH.ams.com** (or **telnet 130.44.1.100**). Login and password are **e-math**]. For journal abbreviations used in bibliographies, see the list of serials in the latest *Mathematical Reviews* annual index. 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.

TEX files available upon request. Authors may request a copy of the TEX files of their papers by sending e-mail to `file-request@math.ams.org` or by contacting the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. 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 e-mail, please include the e-mail 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.

Electronically Prepared Manuscripts. The AMS encourages submission of electronically prepared manuscripts in $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$-LATEX because properly prepared electronic manuscripts save the author proofreading time and move more quickly through the production process. To this end, the Society has prepared 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 for both $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX and $\mathcal{A}\mathcal{M}\mathcal{S}$-LATEX.

Those authors who make use of these style files from the beginning of the writing process will further reduce their own efforts. Electronically submitted manuscripts prepared in plain TEX or LATEX are normally not acceptable due to the high amount of technical time required to insure that the file will run properly through the AMS in-house production system. Users of plain TEX should have little difficulty learning $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX, and LATEX users will find that $\mathcal{A}\mathcal{M}\mathcal{S}$-LATEX is the same as LATEX with additional commands to simplify the typesetting of mathematics.

Authors with FTP access may retrieve an author package from the Society's Internet node `e-MATH.ams.org` (130.44.1.100). For those without FTP access, the author package can be obtained free of charge by sending e-mail to `pub@math.ams.org` (Internet) or from the Publication Division, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. When requesting an author package, please specify $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$-LATEX and the publication in which your paper will appear.

At the time of submission, authors should indicate if the paper has been prepared using $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX or $\mathcal{A}\mathcal{M}\mathcal{S}$-LATEX 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 sent via e-mail to `pub-submit@math.ams.org` (Internet) or on diskette to the Editorial Department, American Mathematical Society, P.O. Box 6248, Providence, RI 02940-6248. When submitting an electronic manuscript, 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 submit files are included in the author package.

An author should submit the original and two copies of the manuscript and retain one copy. The author may suggest an appropriate editor for his paper. All contributions intended for publication and all books for review should be addressed to Walter Gautschi, Chairman, Editorial Committee, Mathematics of Computation, Department of Computer Sciences, Purdue University, West Lafayette, Indiana 47907. The date received, which is published with the final version of an accepted paper, is the date received in the office of the Chairman of the Editorial Committee, and it is the responsibility of the author to submit manuscripts directly to this office.

Any inquiries concerning a paper that has been accepted for publication should be sent directly to the Editorial Department, American Mathematical Society, P. O. Box 6248, Providence, RI 02940-6248.

Editorial Committee

WALTER GAUTSCHI, Chairman. Department of Computer Sciences, Purdue University, West Lafayette, IN 47907; *E-mail*: wxg@cs.purdue.edu

ANDREW M. ODLYZKO, AT&T Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974; *E-mail*: amo@research.att.com

FRANK W. J. OLVER, Institute for Physical Science and Technology, University of Maryland, College Park, MD 20742; *E-mail*: olver@bessel.umd.edu

LARS B. WAHLBIN, Department of Mathematics, Cornell University, Ithaca, NY 14853; *E-mail*: wahlbin@math.cornell.edu

Technical Editor

ERIKA GAUTSCHI, Department of Computer Sciences, Purdue University, West Lafayette, IN 47907; *E-mail*: exg@cs.purdue.edu

Board of Associate Editors

JAMES H. BRAMBLE, Department of Mathematics, Cornell University, Ithaca, NY 14853; *E-mail*: bramble@math.cornell.edu

SUSANNE C. BRENNER, Department of Mathematics, University of South Carolina, Columbia, SC 29208; *E-mail*: brenner@math.scarolina.edu

E. W. CHENEY, Department of Mathematics, University of Texas at Austin, Austin, TX 78712-1082; *E-mail*: cheney@cs.utexas.edu

HOWARD ELMAN, Department of Computer Science, University of Maryland, College Park, MD 20742; *E-mail*: elman@cs.umd.edu

EUGENE ISAACSON, Courant Institute of Mathematical Sciences, New York University, 251 Mercer Street, New York, NY 10012; *E-mail*: isaacson@acf7.nyu.edu

JAMES N. LYNESS, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439; *E-mail*: lyness@mcs.anl.gov

HARALD NIEDERREITER, Institute for Information Processing, Austrian Academy of Sciences, Sonnenfelsgasse 19, A-1010 Vienna, Austria; *E-mail*: nied@qiinfo.oeaw.ac.at

SYVERT P. NØRSETT, Division of Numerical Mathematics, The University of Trondheim and The Norwegian Institute of Technology, Alfred Getz vei 1, N-7034 Trondheim-NTH, Norway; *E-mail*: norsett@imf.unit.no

JOHN E. OSBORN, Department of Mathematics, University of Maryland, College Park, MD 20742; *E-mail*: jeo@julia.umd.edu

STANLEY OSHER, Department of Mathematics, University of California, Los Angeles, CA 90024; *E-mail*: sjo@math.ucla.edu

CARL POMERANCE, Department of Mathematics, The University of Georgia, Athens, GA 30602; *E-mail*: carl@math.uga.edu

RENÉ SCHOOF, Dipartimento di Matematica, 2ª Università di Roma "Tor Vergata", I-00133 Roma, Italy; *E-mail*: schoof@volterra.science.unitn.it; and schoof@fwi.uva.nl

L. RIDGWAY SCOTT, Department of Mathematics, University of Houston, Houston, TX 77204-3476; *E-mail*: scott@casc.math.uh.edu

DANIEL SHANKS, Department of Mathematics, University of Maryland, College Park, MD 20742; *E-mail*: dns@gaby.umd.edu

CHI-WANG SHU, Applied Mathematics Division, Brown University, Providence, RI 02912-0001; *E-mail*: shu@cfm.brown.edu

FRANK STENGER, Department of Computer Science, University of Utah, Salt Lake City, UT 84112; *E-mail*: stenger@cs.utah.edu

HANS J. STETTER, Institut für Numerische Mathematik, Technische Universität Wien, Wiedner Hauptstrasse 6-10, A-1040, Wien, Austria; *E-mail*: stetter@uranus.tuwien.ac.at

G. W. STEWART, Department of Computer Science, University of Maryland, College Park, MD 20742; *E-mail*: stewart@thales.cs.umd.edu

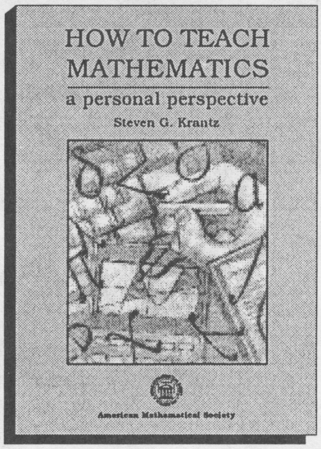
NICO M. TEMME, Stichting Mathematisch Centrum, Centrum voor Wiskunde en Informatica, Kruislaan 413, 1098 SJ Amsterdam, The Netherlands; *E-mail*: nicot@cwi.nl

VIDAR THOMÉE, Mathematics Department, Chalmers University of Technology, S-412 96 Göteborg, Sweden; *E-mail*: thomee@math.chalmers.se

HUGH C. WILLIAMS, Department of Computer Science, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2; *E-mail*: Hugh_Williams@csmail.cs.umanitoba.ca

JOHN W. WRENCH, JR., 102 Mt. Olivet Boulevard, Frederick, MD 21701

An essential teaching tool!



HOW TO TEACH MATHEMATICS

a personal perspective

Steven G. Krantz
Washington University

Intended primarily for the graduate student or novice instructor, this book is also appropriate for those who have been teaching for many years because it highlights the finer points of excellent mathematics teaching. Professor Krantz addresses

- specific methods for successful *mathematics* teaching
- how to deal with students who beg for grades
- how to use applications effectively
- proper ways to choose a textbook
- how to deal with sensitive issues such as cheating, bribery, sexual harassment, and much more!

Lively and humorous, yet serious and sensible, this book is a practical guide to teaching mathematics. With an emphasis on the classroom, *How to Teach Mathematics* addresses specific objectives, situations, and problems in the teaching process. This book is an essential teaching tool.

About the author: Stephen G. Krantz is currently a Professor at Washington University in St. Louis, Missouri. Professor Krantz was awarded the UCLA Alumni Foundation Distinguished Teaching Award in 1979, has authored 80 scholarly papers and 7 books, was awarded the Chauvenet Prize for expository writing by the Mathematical Association of America, and is an internationally recognized scholar.

Call for information about bulk order discounts.

ISBN 0-8218-0197-X, 76 pages (softcover), July 1993
List price $21, Individual member $13, Institutional member $17
To order, please specify HTM/MC

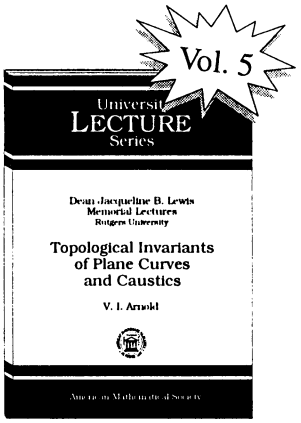
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* **Order from:** American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4AMS in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

University LECTURE Series

Two New Titles from Leading Mathematicians!

V. I. Arnold

Topological Invariants of Plane Curves and Caustics

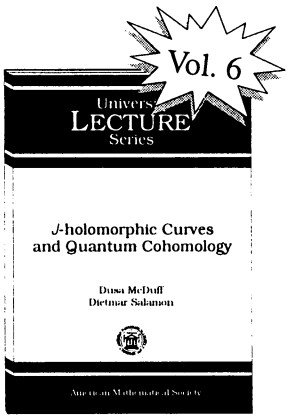


The book describes recent progress in the topological study of plane curves. Arnold describes applications to the geometry of caustics and of wavefronts in symplectic and contact geometry. These applications extend the classical four-vertex theorem of elementary plane geometry to estimates on the minimal number of cusps necessary for the reversion of a wavefront and to generalizations of the last geometrical theorem of Jacobi on conjugated points on convex surfaces. This book will be of interest to all mathematicians, from undergraduate students to active researchers.

July 1994, ISBN 0-8218-0308-5, 60 pp. (softcover),1991 *MSC*: 53, 57, 58
Individual member $18, List $30, Institutional member $24
To order, please specify ULECT/5MC

Dusa McDuff and Dietmar Salamon

J-holomorphic Curves and Quantum Cohomology



The first half of this book is an expository account of the field, explaining the main technical aspects. The second half of the book focuses on the definition of quantum cohomology. McDuff and Salamon establish that the quantum multiplication exists and is associative on appropriate manifolds. They then describe the Givental-Kim calculation of the quantum cohomology of flag manifolds, leading to quantum Chern classes and Witten's calculation for Grassmanians, which relates to the Verlinde algebra. This book is suitable for advanced undergraduate students, research mathematicians, and mathematical physicists.

July 1994, ISBN 0-8218-0332-8, 207 pp. (softcover), 1991 *MSC*: 53; 58, 57
Individual member $25, List $42, Institutional member $34
To order, please specify ULECT/6MC

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or **call toll free 800-321-4AMS** in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

Conference Board of the Mathematical Sciences

CBMS

Regional Conference Series in Mathematics

Numbers 82–84

Hopf Algebras and Their Actions on Rings

Susan Montgomery

This book makes an excellent graduate textbook for a course in Hopf algebras or an introduction to quantum groups.

October 1993; ISBN 0-8218-0738-2, 238 pp. (softcover0;1991 *MSC*: 16; 17, 20, 14
All Individuals $20, List $34; **Ordering code CBMS/82MC**

Harmonic Analysis Techniques for Second Order Elliptic Boundary Value Problems

Carlos E. Kenig

Kenig describes developments and connections for the study of classical boundary value problems on Lipschitz domains and for the corresponding problems for second order elliptic equations in divergence form. Contains many interesting open problems.

June 1994; ISBN 0-8218-0309-3, 146 pp. (softcover); 1991 *MSC*: 35; 42
All Individuals $18, List price $30; **Ordering code CBMS/83MC**

Ten Lectures on the Interface Between Analytic Number Theory and Harmonic Analysis

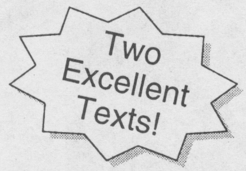
Hugh Montgomery

This book contains lectures presented by Hugh Montgomery at the NSF-CBMS Regional Conference held at Kansas State University. A valuable aspect of this book is that it collects material that was either unpublished or that had appeared only in the research literature. This book is suitable as a textbook in an advanced graduate topics course in number theory.

September 1994; ISBN 0-8218-0737-4, 220 pp. (softcover); 1991 *MSC*: 11, 42; 41
All Individuals $26, List price $44; **Ordering code CBMS/84MC**

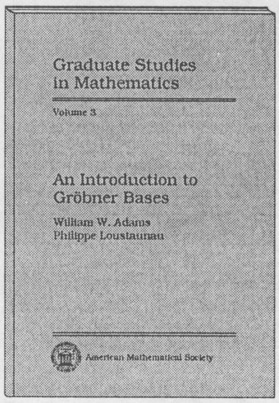
All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or **call toll free 800-321-4AMS** in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

Graduate Studies in Mathematics, Volumes 3 & 4



An Introduction to Gröbner Bases

William W. Adams and Philippe Loustaunau

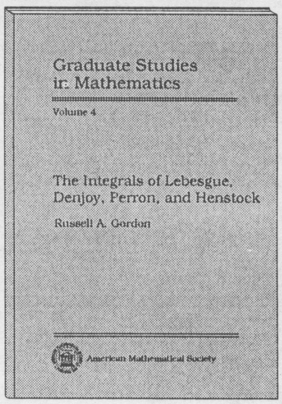


Adams and Loustaunau provide a leisurely and fairly comprehensive introduction to Gröbner bases and their applications. With over 120 worked examples and 200 exercises, this book is suitable as a supplement to a course in commutative algebra or as a textbook for a course in computer algebra or computational commutative algebra. Students of computer science and engineering who have some acquaintance with modern algebra will also find this book appropriate.

July 1994, 289 pp. (hardcover), ISBN 0-8218-3804-0
1991 *MSC*: 13; **Indiv. mem. $29,** List $49, Inst. mem. $39
To order, please specify GSM/3MC

The Integrals of Lebesgue, Denjoy, Perron, and Henstock

Russell A. Gordon



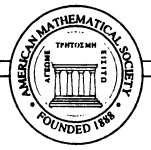
This book provides an elementary, self-contained presentation of the integration processes developed by Lebesgue, Denjoy, Perron, and Henstock. One of the book's unique features is that the Denjoy, Perron, and Henstock integrals are each developed fully and carefully from their corresponding definitions. This book contains over 230 exercises (with solutions) that illustrate and expand the material. It is an excellent textbook for first year graduate students who have a background in real analysis.

August 1994; ISBN 0-8218-3805-9, 395 pp. (hardcover),
1991 *MSC*: 26, 28; **Indiv. mem. $35**, List $59, Inst. mem. $47
To order, please specify GSM/4MC

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or **call toll free 800-321-4AMS** in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

ELECTRONIC PRODUCTS

American Mathematical Society



MathSci Products

Comprehensive coverage of research in mathematics, computer science, and statistics in three forms: CD-ROM, tapes, and online

TEX Products

A family of software and manuals designed specifically for publishing mathematical text

e-MATH

Your Internet connection to the international mathematics community

Three ways to access e-MATH:

telnet e-math.ams.org **gopher e-math.ams.org**

login and password: e-math (lowercase)

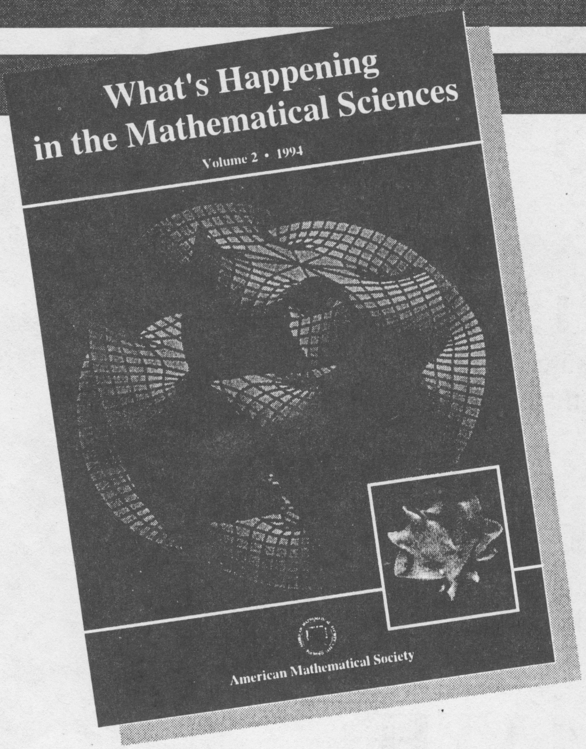
http://e-math.ams.org/web/index.html

For more information please call:
(800) 321-4267 or (401) 455-4166, e-mail: eps@math.ams.org

MathSci Tapes • MathSci Disc • MathSci Online • TEX Software • e-MATH

What's Happening in the Mathematical Sciences

Volume Two!



Barry Cipra

What our readers are saying about Volume 1

"The writing is brilliant, positively brilliant."

"A terrific publication."

"This is a wonderful tool for showing people what mathematics is about and what mathematicians can do."

"A must for all mathematics department reading and coffee lounges."

Volume 2 of *What's Happening* features the same lively writing as Volume 1, and has all new topics. Here you can read about a new class of solitons, the contributions wavelets are making to solving scientific problems, how mathematics is improving medical imaging, and Andrew Wiles's acclaimed work on Fermat's Last Theorem. *What's Happening* can be recommended to all mathematics majors, graduate students, and mathematics clubs—not to mention mathematicians who enjoy reading about recent developments in fields other than their own. *What's Happening* highlights the excitement and wonder of mathematics.

Volume 2, July 1994, ISBN 0-8218-8998-2, 51 pp. (softcover)
List $8; **Order code HAPPENING/MC**
Volume 1, 1993, List $7, **Order code HAPPENING/1MC**

Order Volumes 1 & 2 TODAY!

Standing orders and bulk order discounts are available!
To order call toll free 800-321-4AMS

All prices subject to change. Free shipment by surface: for air delivery, please add $6.50 per title. *Prepayment required.* Order from: American Mathematical Society, P.O. Box 5904, Boston, MA 02206-5904, or call toll free 800-321-4267 in the U.S. and Canada to charge with VISA or MasterCard. Residents of Canada, please include 7% GST.

AMERICAN MATHEMATICAL SOCIETY FOUNDED 1888

(*Continued from back cover*)

R. Crandall, J. Doenias, C. Norrie, and J. Young, The twenty-second Fermat number is composite 863
Paul M. Voutier, Primitive divisors of Lucas and Lehmer sequences 869
Chris K. Caldwell, On the primality of $n! \pm 1$ and $2 \cdot 3 \cdot 5 \cdots p \pm 1$ 889
Reviews and Descriptions of Tables and Books 891
Marchuk, Editor **8**, Sommeijer **9**, Pryce **10**, Hoschek and Lasser **11**, O'Rourke **12**, Schumaker and Webb, Editors **13**, Zwillinger **14**, Smith **15**, Brass and Hämmerlin, Editors **16**, Bouleau and Lépingle **17**, Gray **18**, Eisenbud and Robbiano, Editors **19**
Supplement to "Finite difference method for generalized Zakharov equations" by **Qianshun Chang, Boling Guo, and Hong Jiang** S7
Supplement to "Numerical schemes for conservation laws via Hamilton-Jacobi equations" by **L. Corrias, M. Falcone, and R. Natalini** S13
Supplement to "A numerical Liapunov-Schmidt method with applications to Hopf bifurcation on a square" by **Peter Ashwin, Klaus Böhmer, and Mei Zhen** S19

No microfiche supplement in this issue

MATHEMATICS OF COMPUTATION

CONTENTS

Vol. 64, No. 210 **April 1995**

Manil Suri, Ivo Babuška, and Christoph Schwab, Locking effects in the finite element approximation of plate models 461

Carsten Carstensen and Ernst P. Stephan, A posteriori error estimates for boundary element methods 483

Thanh Tran, The K-operator and the Galerkin method for strongly elliptic equations on smooth curves: Local estimates 501

Zhixin Shi and Brian Hassard, Precise solution of Laplace's equation .. 515

Qianshun Chang, Boling Guo, and Hong Jiang, Finite difference method for generalized Zakharov equations 537

L. Corrias, M. Falcone, and R. Natalini, Numerical schemes for conservation laws via Hamilton-Jacobi equations 555

Tao Tang and Zhen-Huan Teng, The sharpness of Kuznetsov's $O(\sqrt{\Delta x})$ L^1-error estimate for monotone difference schemes 581

C. Palencia, Stability of rational multistep approximations of holomorphic semigroups 591

Christian Lubich and Alexander Ostermann, Runge-Kutta approximation of quasi-linear parabolic equations 601

J. C. Butcher, J. R. Cash, G. Moore, and R. D. Russell, Defect correction for two-point boundary value problems on nonequidistant meshes 629

Peter Ashwin, Klaus Böhmer, and Mei Zhen, A numerical Liapunov-Schmidt method with applications to Hopf bifurcation on a square 649

Knut S. Eckhoff, Accurate reconstructions of functions of finite regularity from truncated Fourier series expansions 671

Stanisław Lewanowicz and Stefan Paszkowski, An analytic method for convergence acceleration of certain hypergeometric series 691

Georgi R. Grozev and Qazi I. Rahman, A quadrature formula with zeros of Bessel functions as nodes 715

David Chien, Numerical evaluation of surface integrals in three dimensions 727

J.A.C. Weideman, Computing the Hilbert transform on the real line 745

Alan Edelman and H. Murakami, Polynomial roots from companion matrix eigenvalues 763

Erich Kaltofen, Analysis of Coppersmith's block Wiedemann algorithm for the parallel solution of sparse linear systems 777

Christian Biester, Peter J. Grabner, Gerhard Larcher, and Robert F. Tichy, Adaptive search in quasi-Monte-Carlo optimization 807

N. P. Smart, The solution of triangularly connected decomposable form equations 819

Tsuneo Ishikawa, On the number of zeros of diagonal forms 841

B. M. M. de Weger, A Thue equation with quadratic integers as variables 855

(*Continued on inside back cover*)