
VOLUME 72 NUMBER 244



OCTOBER 2003

MATHEMATICS OF COMPUTATION

A M E R I C A N M A T H E M A T I C A L S O C I E T Y

EDITED BY

Randolph E. Bank
Christine Bernardi
David W. Boyd
Susanne C. Brenner
Richard P. Brent
Joe P. Buhler
Carsten Carstensen
Arjeh M. Cohen
Ronald F. A. Cools
Howard Elman
Richard S. Falk
Daniel W. Lozier
Zhi-Quan Luo
Harald Niederreiter
Ricardo H. Nochetto
Stanley Osher
Haesun Park
Joseph E. Pasciak
Lothar Reichel
René Schoof
Igor E. Shparlinski
Chi-Wang Shu, *Managing Editor*
Frank Stenger
Denis Talay
Nico M. Temme
Lars B. Wahlbin
Joseph D. Ward
Hugh C. Williams
Jinchao Xu

PROVIDENCE, RHODE ISLAND USA

ISSN 0025-5718

Available electronically at
www.ams.org/mcom/

Mathematics of Computation

This journal is devoted to research articles of the highest quality in computational mathematics. Areas covered include numerical analysis, computational discrete mathematics, including number theory, algebra and combinatorics, and related fields such as stochastic numerical methods. Articles must be of significant computational interest and contain original and substantial mathematical analysis or development of computational methodology. Reviews of books in areas related to computational mathematics are also included.

Submission information. See **Information for Authors** at the end of this issue.

Publisher Item Identifier. The Publisher Item Identifier (PII) appears at the top of the first page of each article published in this journal. This alphanumeric string of characters uniquely identifies each article and can be used for future cataloging, searching, and electronic retrieval.

Postings to the AMS website. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

Subscription information. *Mathematics of Computation* is published quarterly. Beginning in January 1996 *Mathematics of Computation* is accessible from www.ams.org/publications/. Subscription prices for Volume 72 (2003) are as follows: for paper delivery, \$411 list, \$329 institutional member, \$370 corporate member, \$267 member of CBMS organizations; \$247 individual member; for electronic delivery, \$370 list, \$296 institutional member, \$333 corporate member, \$241 member of CBMS organizations, \$222 individual member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. If ordering the paper version, add \$13 for surface delivery outside the United States and India; \$18 to India. Expedited delivery to destinations in North America is \$17; elsewhere \$56.

Back number information. For back issues see the www.ams.org/bookstore.

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2294 USA.

Copying and reprinting. Material in this journal may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. Requests can also be made by e-mail to reprint-permission@ams.org.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

Mathematics of Computation is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2294 USA. Periodicals postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Mathematics of Computation, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

© 2003 by the American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Zentralblatt MATH*, *Science Citation Index*[®], *Science Citation Index*TM-*Expanded*, *ISI Alerting Services*SM, *CompuMath Citation Index*[®], and *Current Contents*[®]/*Physical, Chemical & Earth Sciences*.

⊗ The paper used in this book is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 08 07 06 05 04 03

MATHEMATICS OF COMPUTATION

CONTENTS

Vol. 72, No. 244

October 2003

Constantin Bacuta, James H. Bramble, and Jinchao Xu, Regularity estimates for elliptic boundary value problems in Besov spaces	1577
Nikolai Yu. Bakaev, Vidar Thomée, and Lars B. Wahlbin, Maximum-norm estimates for resolvents of elliptic finite element operators	1597
Francesca Fierro and Andreas Veerer, On the a posteriori error analysis for equations of prescribed mean curvature	1611
Ville Havu and Juhani Pitkäranta, Analysis of a bilinear finite element for shallow shells. II: Consistency error	1635
Tianxiao Zhou, Stabilized hybrid finite element methods based on the combination of saddle point principles of elasticity problems	1655
Bo Li, Finite element analysis of a class of stress-free martensitic microstructures	1675
Song Wang and Zi-Cai Li, A nonconforming combination of the finite element and volume methods with an anisotropic mesh refinement for a singularly perturbed convection-diffusion equation	1689
Barbara Kaltenbacher, V-cycle convergence of some multigrid methods for ill-posed problems	1711
Xu-Dong Liu and Thomas C. Sideris, Convergence of the ghost fluid method for elliptic equations with interfaces	1731
Kirill Kopotun, Marian Neamtu, and Bojan Popov, Weakly nonoscillatory schemes for scalar conservation laws	1747
B. Cano and A. Durán, Analysis of variable-stepsize linear multistep methods with special emphasis on symmetric ones	1769
B. Cano and A. Durán, A technique to construct symmetric variable-stepsize linear multistep methods for second-order systems	1803
Philippe P. Pébay and Timothy J. Baker, Analysis of triangle quality measures	1817
S.-H. Lui, A pseudospectral mapping theorem	1841
Gradimir V. Milovanović and Miodrag M. Spalević, Error bounds for Gauss-Turán quadrature formulae of analytic functions	1855
Scott N. Kersey, On the problems of smoothing and near-interpolation .	1873
Peter Fleischmann, Markus Chr. Holder, and Peter Roelse, The black-box Niederreiter algorithm and its implementation over the binary field	1887
P. B. Borwein, C. G. Pinner, and I. E. Pritsker, Monic integer Chebyshev problem	1901
R. J. Stroeker and N. Tzanakis, Computing all integer solutions of a genus 1 equation	1917
Alfred J. van der Poorten, A note on NUCOMP	1935
Roger Alexander, Index-doubling in sequences by Aitken extrapolation .	1947
W. Bley, Computation of Stark-Tamagawa units	1963
John W. Jones and David P. Roberts, Septic fields with discriminant $\pm 2^a 3^b$	1975
Joachim von zur Gathen, Irreducible trinomials over finite fields	1987

M. K. Bos , Coding the principal character formula for affine Kac-Moody Lie algebras	2001
Klaus Bongartz and Thomas Fritzsche , On minimal disjoint degenerations for preprojective representations of quivers	2013
A. Stoimenow , On the unknotting number of minimal diagrams	2043
Jeffrey J. Holt , The minimal number of solutions to $\phi(n) = \phi(n + k)$	2059
Peter Borwein, Petr Lisoněk, and Colin Percival , Computational investigations of the Prouhet-Tarry-Escott Problem	2063
Karsten Blankenagel, Walter Borho, and Axel vom Stein , New amicable four-cycles	2071
D. E. Iannucci and R. M. Sorli , On the total number of prime factors of an odd perfect number	2077
Zhenxiang Zhang and Min Tang , Finding strong pseudoprimes to several bases. II	2085
M. J. Jacobson, Jr., Á. Pintér, and P. G. Walsh , A computational approach for solving $y^2 = 1^k + 2^k + \cdots + x^k$	2099

No microfiche supplement in this issue

INDEX TO VOLUME 72 (2003)

- Alexander, Roger. *Index-doubling in sequences by Aitken extrapolation*, 1947
- Applegate, David, and Lagarias, Jeffrey C. *Lower bounds for the total stopping time of $3x + 1$ iterates*, 1035
- Bacuta, Constantin, Bramble, James H., and Xu, Jinchao. *Regularity estimates for elliptic boundary value problems in Besov spaces*, 1577
- Bakaev, Nikolai Yu., Thomée, Vidar, and Wahlbin, Lars B. *Maximum-norm estimates for resolvents of elliptic finite element operators*, 1597
- Baker, Timothy, J. *See Pébay, Philippe P.*
- Belhachmi, Z., and Ben Belgacem, F. *Quadratic finite element approximation of the Signorini problem*, 83
- Ben Belgacem, F. *See Belhachmi, Z.*
- Ben Belgacem, F., and Renard, Y. *Hybrid finite element methods for the Signorini problem*, 1117
- Blankenagel, Karsten, Borho, Walter, and vom Stein, Axel. *New amicable four-cycles*, 2071
- Blecksmith, Richard, and Brillhart, John. *Linear quintuple-product identities*, 1019
- Bley, W. *Computation of Stark-Tamagawa units*, 1963
- Bongartz, Klaus, and Fritzsche, Thomas. *On minimal disjoint degenerations for preprojective representations of quivers*, 2013
- Borho, Walter. *See Blankenagel, Karsten*
- Borwein, P. B., Pinner, C. G., and Pritsker, I. E. *Monic integer Chebyshev problem*, 1901
- Borwein, Peter, Lisoněk, Petr, and Percival, Colin. *Computational investigations of the Prouhet-Tarry-Escott Problem*, 2063
- Borwein, Peter, and Mossinghoff, Michael J. *Newman polynomials with prescribed vanishing and integer sets with distinct subset sums*, 787
- Bos, M. K. *Coding the principal character formula for affine Kac-Moody Lie algebras*, 2001
- Botchorishvili, Ramaz, Perthame, Benoit, and Vasseur, Alexis. *Equilibrium schemes for scalar conservation laws with stiff sources*, 131
- Böttcher, A., Embree, M., and Sokolov, V. I. *The spectra of large Toeplitz band matrices with a randomly perturbed entry*, 1329
- Bramble, James H. *See Bacuta, Constantin*
- Brent, Richard P., Larvala, Samuli, and Zimmermann, Paul. *A fast algorithm for testing reducibility of trinomials mod 2 and some new primitive trinomials of degree 3021377*, 1443
- Brillhart, John. *See Blecksmith, Richard*
- Cano, B., and Durán, A. *Analysis of variable-stepsize linear multistep methods with special emphasis on symmetric ones*, 1769
- . *A technique to construct symmetric variable-stepsize linear multistep methods for second-order systems*, 1803
- Chang, Ku-Young, and Kwon, Soun-Hi. *The class number one problem for some non-abelian normal CM-fields of degree 48*, 1003
- Chen, Sheng. *See You, Hong*
- Chen, Zhiming, and Hou, Thomas Y. *A mixed multiscale finite element method for elliptic problems with oscillating coefficients*, 541
- Chou, So-Hsiang, Kwak, Do Y., and Kim, Kwang Y. *Mixed finite volume methods on nonstaggered quadrilateral grids for elliptic problems*, 525
- Cockburn, Bernardo, Luskin, Mitchell, Shu, Chi-Wang, and Süli, Endre. *Enhanced accuracy by post-processing for finite element methods for hyperbolic equations*, 577
- Cohen, Albert, Kaber, Sidi Mahmoud, Müller, Siegfried, and Postel, Marie. *Fully adaptive multiresolution finite volume schemes for conservation laws*, 183
- Cohen, Henri, Diaz y Diaz, Francisco, and Olivier, Michel. *Constructing complete tables of quartic fields using Kummer theory*, 941
- Conrad, Marc, and Replogle, Daniel R. *Nontrivial Galois module structure of cyclotomic fields*, 891
- Costello, Patrick J. *New amicable pairs of type (2, 2) and type (3, 2)*, 489
- Crandall, Richard E., Mayer, Ernst W., and Papadopoulos, Jason S. *The twenty-fourth Fermat number is composite*, 1555
- Cremona, J. E., and Rusin, D. *Efficient solution of rational conics*, 1417
- Dai, Yu-Hong. *A family of hybrid conjugate gradient methods for unconstrained optimization*, 1317

- Demkowicz, L. *See* Vardapetyan, L.
- Dian, Jianwei, and Kearfott, R. Baker. *Existence verification for singular and nonsmooth zeros of real nonlinear systems*, 757
- Diaz y Diaz, Francisco. *See* Cohen, Henri
- Dresden, Gregory P. *Sums of heights of algebraic numbers*, 1487
- Durán, A. *See* Cano, B.
- Eick, Bettina, and Ostheimer, Gretchen. *On the orbit-stabilizer problem for integral matrix actions of polycyclic groups*, 1511
- Elman, Howard C., and Ramage, Alison. *A characterisation of oscillations in the discrete two-dimensional convection-diffusion equation*, 263
- Embree, M. *See* Böttcher, A.
- van den Eshof, Jasper. *See* Sleijpen, Gerard L. G.
- Fierro, Francesca, and Veaser, Andreas. *On the a posteriori error analysis for equations of prescribed mean curvature*, 1611
- Fleischmann, Peter, Holder, Markus Chr., and Roelse, Peter. *The black-box Niederreiter algorithm and its implementation over the binary field*, 1887
- Floater, Michael S. *One-to-one piecewise linear mappings over triangulations*, 685
- Fritzsche, Thomas. *See* Bongartz, Klaus
- Gao, Shuhong. *Factoring multivariate polynomials via partial differential equations*, 801
- Garcia, Mariano. *The first known type (7,1) amicable pair*, 939
- von zur Gathen, Joachim. *Irreducible trinomials over finite fields*, 1987
- Giga, Yoshikazu. *See* Tsai, Yen-Hsi Richard
- González, Josep. *See* González-Jiménez, Enrique
- González-Jiménez, Enrique, and González, Josep. *Modular curves of genus 2*, 397
- Gopalakrishnan, Jayadeep, and Pasciak, Joseph E. *Overlapping Schwarz preconditioners for indefinite time harmonic Maxwell equations*, 1
- Gragg, William B. *See* Wang, Tai-Lin
- Grün, Günther. *On the convergence of entropy consistent schemes for lubrication type equations in multiple space dimensions*, 1251
- Han, Xuli. *Piecewise quadratic trigonometric polynomial curves*, 1369
- Havu, Ville, and Pitkäranta, Juhani. *Analysis of a bilinear finite element for shallow shells. II: Consistency error*, 1635
- Hernández, Erwin, and Rodríguez, Rodolfo. *Finite element approximation of spectral problems with Neumann boundary conditions on curved domains*, 1099
- Heß, Florian, Pauli, Sebastian, and Pohst, Michael E. *Computing the multiplicative group of residue class rings*, 1531
- Hiptmair, R. *Analysis of multilevel methods for eddy current problems*, 1281
- Hoffman, J. William, Madden, James J., and Zhang, Hong. *Pseudozeros of multivariate polynomials*, 975
- Holder, Markus Chr. *See* Fleischmann, Peter
- Holt, Jeffrey J. *The minimal number of solutions to $\phi(n) = \phi(n+k)$* , 2059
- Hou, Thomas Y. *See* Chen, Zhiming
- Howgrave-Graham, Nick A., Nguyen, Phong Q., and Shparlinski, Igor E. *Hidden number problem with hidden multipliers, timed-release crypto, and noisy exponentiation*, 1473
- Huang, Yunqing, and Xu, Jinchao. *A conforming finite element method for overlapping and nonmatching grids*, 1057
- Hübl, Reinhold, and Swanson, Irena. *Normal cones of monomial primes*, 459
- Huhtanen, Marko. *Orthogonal polyanalytic polynomials and normal matrices*, 355
- Iannucci, D. E., and Sorli, R. M. *On the total number of prime factors of an odd perfect number*, 2077
- Itoh, Tsuyoshi. *A computation of minimal polynomials of special values of Siegel modular functions*, 969
- Jacobson, M. J., Jr., Pintér, Á., and Walsh, P. G. *A computational approach for solving $y^2 = 1^k + 2^k + \dots + x^k$* , 2099
- Jacobson, Michael J., Jr., and Williams, Hugh C. *New quadratic polynomials with high densities of prime values*, 499
- Jenkins, Paul M. *Odd perfect numbers have a prime factor exceeding 10^7* , 1549
- Jones, John W., and Roberts, David P. *Septic fields with discriminant $\pm 2^a 3^b$* , 1975

- Joux, Antoine, and Lercier, Reynald. *Improvements to the general number field sieve for discrete logarithms in prime fields. A comparison with the gaussian integer method*, 953
- Kaber, Sidi Mahmoud. *See* Cohen, Albert
- Kaltenbacher, Barbara. *V-cycle convergence of some multigrid methods for ill-posed problems*, 1711
- Kang, Sheon-Young, Koltracht, Israel, and Rawitscher, George. *Nyström-Clenshaw-Curtis quadrature for integral equations with discontinuous kernels*, 729
- Kearfott, R. Baker. *See* Dian, Jianwei
- Kersey, Scott N. *On the problems of smoothing and near-interpolation*, 1873
- Kim, Kwang Y. *See* Chou, So-Hsiang
- Kimura, Tatsuo. *See* Kogiso, Takeyoshi
- King, Oliver D. *A mass formula for unimodular lattices with no roots*, 839
- Kirby, Robert. *On the convergence of high resolution methods with multiple time scales for hyperbolic conservation laws*, 1239
- Knyazev, Andrew, and Widlund, Olof. *Lavrentiev regularization + Ritz approximation = uniform finite element error estimates for differential equations with rough coefficients*, 17
- Kobayashi, Miyuki. *See* Kogiso, Takeyoshi
- Koch, Othmar, and Weinmüller, Ewa B. *The convergence of shooting methods for singular boundary value problems*, 289
- Kogiso, Takeyoshi, Miyabe, Go, Kobayashi, Miyuki, and Kimura, Tatsuo. *Relative invariants of some 2-simple prehomogeneous vector spaces*, 865
- Koltracht, Israel. *See* Kang, Sheon-Young
- Kopotun, Kirill, Neamtu, Marian, and Popov, Bojan. *Weakly nonoscillatory schemes for scalar conservation laws*, 1747
- Kreminski, Rick. *Newton-Cotes integration for approximating Stieltjes (generalized Euler) constants*, 1379
- Kwak, Do Y. *See* Chou, So-Hsiang
- Kwon, Soun-Hi. *See* Chang, Ku-Young
- Lagarias, Jeffrey C. *See* Applegate, David
- Lai, Ming-Jun, and Schumaker, Larry L. *Macro-elements and stable local bases for splines on Powell-Sabin triangulations*, 335
- Larvala, Samuli. *See* Brent, Richard P.
- Lasser, Caroline, and Toselli, Andrea. *An overlapping domain decomposition preconditioner for a class of discontinuous Galerkin approximations of advection-diffusion problems*, 1215
- Lercier, Reynald. *See* Joux, Antoine
- Leydold, Josef. *Short universal generators via generalized ratio-of-uniforms method*, 1453
- Li, Bo. *Finite element analysis of a class of stress-free martensitic microstructures*, 1675
- Li, Ren-Cang. *On perturbations of matrix pencils with real spectra, a revisit*, 715
- Li, Zi-Cai. *See* Wang, Song
- Lin, Ping. *Theoretical and numerical analysis for the quasi-continuum approximation of a material particle model*, 657
- Lisoněk, Petr. *See* Borwein, Peter
- Liu, Hailiang. *The l^1 global decay to discrete shocks for scalar monotone schemes*, 227
- Liu, Xu-Dong, and Sideris, Thomas C. *Convergence of the ghost fluid method for elliptic equations with interfaces*, 1731
- Lui, S.-H. *A pseudospectral mapping theorem*, 1841
- Luskin, Mitchell. *See* Cockburn, Bernardo
- Madden, James J. *See* Hoffman, J. William
- Mathew, T. P., and Russo, G. *Maximum norm stability of difference schemes for parabolic equations on overset nonmatching space-time grids*, 619
- Matsuzawa, Yuki, Suzuki, Takashi, and Tsuchiya, Takuya. *Finite element approximation of H-surfaces*, 607
- Mayer, Ernst W. *See* Crandall, Richard E.
- Meyrignac, Jean-Charles. *See* Resta, Giovanni
- Milovanović, Gradimir V., and Spalević, Miodrag M. *Error bounds for Gauss-Turán quadrature formulae of analytic functions*, 1855
- Miyabe, Go. *See* Kogiso, Takeyoshi

- Morin, Pedro, Nochetto, Ricardo H., and Siebert, Kunibert G. *Local problems on stars: A posteriori error estimators, convergence, and performance*, 1067
- Mossinghoff, Michael J. *See* Borwein, Peter
- Müller, Siegfried. *See* Cohen, Albert
- Neamtu, Marian. *See* Kopotun, Kirill
- Nguyen, Phong Q. *See* Howgrave-Graham, Nick A.
- Nochetto, Ricardo H. *See* Morin, Pedro
- Olivier, Michel. *See* Cohen, Henri
- Osher, Stanley. *See* Tsai, Yen-Hsi Richard
- Ostheimer, Gretchen. *See* Eick, Bettina
- Papadopoulos, Jason S. *See* Crandall, Richard E.
- Pasciak, Joseph E. *See* Gopalakrishnan, Jayadeep
- Pauli, Sebastian. *See* Heß, Florian
- Pébay, Philippe P., and Baker, Timothy J. *Analysis of triangle quality measures*, 1817
- Percival, Colin. *Rapid multiplication modulo the sum and difference of highly composite numbers*, 387
- . *See* Borwein, Peter
- Perthame, Benoit. *See* Botchorishvili, Ramaz
- Perugia, Ilaria, and Schötzau, Dominik. *The hp-local discontinuous Galerkin method for low-frequency time-harmonic Maxwell equations*, 1179
- Pinner, C. G. *See* Borwein, P. B.
- Pintér, Á. *See* Jacobson, M. J., Jr.
- Pitkäranta, Juhani. *See* Havu, Ville
- Pohst, Michael E. *See* Heß, Florian
- van der Poorten, A. J., te Riele, H. J. J., and Williams, H. C. *Corrigenda and addition to “Computer verification of the Ankeny-Artin-Chowla conjecture for all primes less than 100 000 000 000”*, 521
- van der Poorten, Alfred J. *A note on NUCOMP*, 1935
- Popov, Bojan. *See* Kopotun, Kirill
- Postel, Marie. *See* Cohen, Albert
- Pritsker, I. E. *See* Borwein, P. B.
- Ramage, Alison. *See* Elman, Howard C.
- Rawitscher, George. *See* Kang, Sheon-Young
- Renard, Y. *See* Ben Belgacem, F.
- Replogle, Daniel R. *See* Conrad, Marc
- Resta, Giovanni, and Meyrignac, Jean-Charles. *The smallest solutions to the diophantine equation $x^6 + y^6 = a^6 + b^6 + c^6 + d^6 + e^6$* , 1051
- Rieder, Andreas, and Schuster, Thomas. *The approximate inverse in action II: convergence and stability*, 1399
- te Riele, H. J. J. *See* van der Poorten, A. J.
- Roberts, A. J. *A holistic finite difference approach models linear dynamics consistently*, 247
- Roberts, David P. *See* Jones, John W.
- Rodríguez, Rodolfo. *See* Hernández, Erwin
- Roelse, Peter. *See* Fleischmann, Peter
- Rusin, D. *See* Cremona, J. E.
- Russo, G. *See* Mathew, T. P.
- Schoof, René. *Class numbers of real cyclotomic fields of prime conductor*, 913
- Schötzau, Dominik. *See* Perugia, Ilaria
- Schumaker, Larry L. *See* Lai, Ming-Jun
- Schuster, Thomas. *See* Rieder, Andreas
- Serra Capizzano, S., and Tyrtshnikov, E. *How to prove that a preconditioner cannot be super-linear*, 1305
- Shparlinski, Igor E. *See* Howgrave-Graham, Nick A.
- Shu, Chi-Wang. *See* Cockburn, Bernardo
- Sideris, Thomas C. *See* Liu, Xu-Dong
- Sidi, Avram. *A convergence and stability study of the iterated Lubkin transformation and the θ -algorithm*, 419
- Siebert, Kunibert G. *See* Morin, Pedro

- Skjerna, Berit. *Sato's algorithm in characteristic 2*, 477
- Sleijpen, Gerard L. G., van den Eshof, Jasper, and Smit, Paul. *Optimal a priori error bounds for the Rayleigh-Ritz method*, 677
- Smit, Paul. *See* Sleijpen, Gerard L. G.
- Sokolov, V. I. *See* Böttcher, A.
- Sorli, R. M. *See* Iannucci, D. E.
- Spalević, Miodrag M. *See* Milovanović, Gradimir V.
- Spijker, M. N., Tracogna, S., and Welfert, B. D. *About the sharpness of the stability estimates in the Kreiss matrix theorem*, 697
- vom Stein, Axel. *See* Blankenagel, Karsten
- Stevenson, Rob. *A stable, direct solver for the gradient equation*, 41
 ———. *An analysis of nonconforming multi-grid methods, leading to an improved method for the Morley element*, 55
- Stoimenow, A. *On the unknotting number of minimal diagrams*, 2043
- Stroeker, R. J., and Tzanakis, N. *Computing all integer solutions of a genus 1 equation*, 1917
- Sugihara, Masaaki. *Near optimality of the sinc approximation*, 767
- Süli, Endre. *See* Cockburn, Bernardo
- Suzuki, Takashi. *See* Matsuzawa, Yuki
- Swanson, Irena. *See* Hübl, Reinhold
- Tang, Min. *See* Zhang, Zhenxiang
- Thomé, Vidar. *See* Bakaev, Nikolai Yu.
- Toselli, Andrea. *See* Lasser, Caroline
- Tracogna, S. *See* Spijker, M. N.
- Tsai, Yen-Hsi Richard, Giga, Yoshikazu, and Osher, Stanley. *A level set approach for computing discontinuous solutions of Hamilton-Jacobi equations*, 159
- Tsuchiya, Takuya. *See* Matsuzawa, Yuki
- Tyrtshnikov, E. *See* Serra Capizzano, S.
- Tzanakis, N. *See* Stroeker, R. J.
- Vardapetyan, L., and Demkowicz, L. *Full-wave analysis of dielectric waveguides at a given frequency*, 105
- Vasseur, Alexis. *See* Botchorishvili, Ramaz
- Veese, Andreas. *See* Fierro, Francesca
- Wahlbin, Lars B. *See* Bakaev, Nikolai Yu.
- Walsh, P. G. *See* Jacobson, M. J., Jr.
- Wang, Song, and Li, Zi-Cai. *A nonconforming combination of the finite element and volume methods with an anisotropic mesh refinement for a singularly perturbed convection-diffusion equation*, 1689
- Wang, Tai-Lin, and Gragg, William B. *Convergence of the unitary QR algorithm with a uni-modular Wilkinson shift*, 375
- Wang, Xiaoqun. *Strong tractability of multivariate integration using quasi-Monte Carlo algorithms*, 823
- Weinmüller, Ewa B. *See* Koch, Othmar
- Welfert, B. D. *See* Spijker, M. N.
- Weng, Annegret. *Constructing hyperelliptic curves of genus 2 suitable for cryptography*, 435
- Widlund, Olof. *See* Knyazev, Andrew
- Williams, H. C. *See* van der Poorten, A. J.
- Williams, Hugh C. *See* Jacobson, Michael J., Jr.
- Wu, Qiang. *On the linear independence measure of logarithms of rational numbers*, 901
- Xu, Jinchao. *See* Bacuta, Constantin
 ———. *See* Huang, Yunqing
- Ying, Lung-An. *Convergence study of the Chorin-Marsden formula*, 307
- Yoon, Jung-ho. *L_p -error estimates for "shifted" surface spline interpolation on Sobolev space*, 1349
- You, Hong, and Chen, Sheng. *The tame kernel of imaginary quadratic fields with class number 2 or 3*, 1501
- Zhang, Hong. *See* Hoffman, J. William
- Zhang, Zhenxiang, and Tang, Min. *Finding strong pseudoprimes to several bases. II*, 2085

INDEX TO VOLUME 72 (2003)

- Zhang, Zhimin. *Finite element superconvergence on Shishkin mesh for 2-D convection-diffusion problems*, 1147
- Zhou, Tianxiao. *Stabilized hybrid finite element methods based on the combination of saddle point principles of elasticity problems*, 1655
- Zimmermann, Paul. *See Brent, Richard P.*

INDEX OF REVIEWS BY AUTHOR OF WORK REVIEWED

<i>Author</i>	<i>Review Number</i>	<i>Classification</i>	<i>Page</i>
CIARLET, P. G.	5	65-02, 65N30, 65N15, 65N12	1575
ESTEP, D., & TAVENER, S. (EDITORS)	2	65M12, 65L07	1055
HÄGGSTRÖM, O.	3	60-01, 65C40, 65-01	1573
2 See ESTEP, D.		1055	
VOGEL, CURTIS R.	4	65F22, 47A52, 65J20, 65N21, 65C60, 35R30, 68U10	1574
WONG, R.	1	41-02, 41A60, 33-00	1055

INDEX OF REVIEWS BY SUBJECT OF WORK REVIEWED

<i>Author</i>	<i>Review Number</i>	<i>Title</i>	<i>Page</i>
33-XX Special functions			
33-00		<i>General reference works (handbooks, dictionaries, bibliographies, etc.)</i>	
WONG, R.	1	Asymptotic approximations of integrals	1055
35-XX Partial differential equations			
35R30		<i>Inverse problems (undetermined coefficients, etc.) for PDE</i>	
VOGEL, CURTIS R.	4	Computational methods for inverse problems	1574
41-XX Approximations and expansions			
41-02		<i>Research exposition (monographs, survey articles)</i>	
WONG, R.	1	Asymptotic approximations of integrals	1055
41A60		<i>Asymptotic approximations, asymptotic expansions (steepest descent, etc.)</i>	
WONG, R.	1	Asymptotic approximations of integrals	1055
47-XX Operator theory			
47A52		<i>Ill-posed problems, regularization</i>	
VOGEL, CURTIS R.	4	Computational methods for inverse problems	1574
60-XX Probability theory and stochastic processes			
60-01		<i>Instructional exposition (textbooks, tutorial papers, etc.)</i>	
HÄGGSTRÖM, O.	3	Finite Markov chains and algorithmic applications	1573
65-XX Numerical analysis			
65-01		<i>Instructional exposition (textbooks, tutorial papers, etc.)</i>	
HÄGGSTRÖM, O.	3	Finite Markov chains and algorithmic applications	1573
65-02		<i>Research exposition (monographs, survey articles)</i>	
CIARLET, P. G.	5	The finite element method for elliptic problems	1575
65C40		<i>Computational Markov chains</i>	
HÄGGSTRÖM, O.	3	Finite Markov chains and algorithmic applications	1573

INDEX OF REVIEWS BY SUBJECT OF WORK REVIEWED

65C60	<i>Computational problems in statistics</i>			
VOGEL, CURTIS R.		4	Computational methods for inverse problems	1574
65F22	<i>Ill-posedness, regularization</i>			
VOGEL, CURTIS R.		4	Computational methods for inverse problems	1574
65J20	<i>Improperly posed problems; regularization</i>			
VOGEL, CURTIS R.		4	Computational methods for inverse problems	1574
65L07	<i>Numerical investigation of stability of solutions</i>			
ESTEP, D., & TAVENER, S. (EDITORS)		2	Collected lectures on the preservation of stability under discretization	1055
65M12	<i>Stability and convergence of numerical methods</i>			
ESTEP, D., & TAVENER, S. (EDITORS)		2	Collected lectures on the preservation of stability under discretization	1055
65N12	<i>Stability and convergence of numerical methods</i>			
CIARLET, P. G.		5	The finite element method for elliptic problems	1575
65N15	<i>Error bounds</i>			
CIARLET, P. G.		5	The finite element method for elliptic problems	1575
65N21	<i>Inverse problems</i>			
VOGEL, CURTIS R.		4	Computational methods for inverse problems	1574
65N30	<i>Finite elements, Rayleigh-Ritz and Galerkin methods, finite methods</i>			
CIARLET, P. G.		5	The finite element method for elliptic problems	1575
68-XX Computer science				
68U10	<i>Image processing</i>			
VOGEL, CURTIS R.		4	Computational methods for inverse problems	1574

VOLUME 72



2003

MATHEMATICS OF COMPUTATION

A M E R I C A N M A T H E M A T I C A L S O C I E T Y

EDITED BY

Randolph E. Bank
Christine Bernardi
David W. Boyd
Susanne C. Brenner
Richard P. Brent
Joe P. Buhler
Carsten Carstensen
Arjeh M. Cohen
Ronald F. A. Cools
Howard Elman
Richard S. Falk
Daniel W. Lozier
Zhi-Quan Luo
Harald Niederreiter
Ricardo H. Nochetto
Stanley Osher
Haesun Park
Joseph E. Pasciak
Lothar Reichel
René Schoof
Igor E. Shparlinski
Chi-Wang Shu, *Managing Editor*
Frank Stenger
Denis Talay
Nico M. Temme
Lars B. Wahlbin
Joseph D. Ward
Hugh C. Williams
Jinchao Xu

PROVIDENCE, RHODE ISLAND USA

ISSN 0025-5718

Mathematics of Computation

This journal is devoted to research articles of the highest quality in computational mathematics. Areas covered include numerical analysis, computational discrete mathematics, including number theory, algebra and combinatorics, and related fields such as stochastic numerical methods. Articles must be of significant computational interest and contain original and substantial mathematical analysis or development of computational methodology. Reviews of books in areas related to computational mathematics are also included.

Submission information. See **Information for Authors** at the end of this issue.

Publisher Item Identifier. The Publisher Item Identifier (PII) appears at the top of the first page of each article published in this journal. This alphanumeric string of characters uniquely identifies each article and can be used for future cataloging, searching, and electronic retrieval.

Postings to the AMS website. Articles are posted to the AMS website individually after proof is returned from authors and before appearing in an issue.

Subscription information. *Mathematics of Computation* is published quarterly. Beginning in January 1996 *Mathematics of Computation* is accessible from www.ams.org/publications/. Subscription prices for Volume 72 (2003) are as follows: for paper delivery, \$411 list, \$329 institutional member, \$370 corporate member, \$267 member of CBMS organizations; \$247 individual member; for electronic delivery, \$370 list, \$296 institutional member, \$333 corporate member, \$241 member of CBMS organizations, \$222 individual member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. If ordering the paper version, add \$13 for surface delivery outside the United States and India; \$18 to India. Expedited delivery to destinations in North America is \$17; elsewhere \$56.

Back number information. For back issues see the www.ams.org/bookstore.

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2294 USA.

Copying and reprinting. Material in this journal may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. Requests can also be made by e-mail to reprint-permission@ams.org.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

Mathematics of Computation is published quarterly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2294 USA. Periodicals postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Mathematics of Computation, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

© 2003 by the American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Zentralblatt MATH*, *Science Citation Index*[®], *Science Citation Index*TM-*Expanded*, *ISI Alerting Services*SM, *CompuMath Citation Index*[®], and *Current Contents*[®]/*Physical, Chemical & Earth Sciences*.

⊗ The paper used in this book is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 08 07 06 05 04 03

MATHEMATICS OF COMPUTATION

CONTENTS

Vol. 72, No. 241

January 2003

Jayadeep Gopalakrishnan and Joseph E. Pasciak , Overlapping Schwarz preconditioners for indefinite time harmonic Maxwell equations	1
Andrew Knyazev and Olof Widlund , Lavrentiev regularization + Ritz approximation = uniform finite element error estimates for differential equations with rough coefficients	17
Rob Stevenson , A stable, direct solver for the gradient equation	41
Rob Stevenson , An analysis of nonconforming multi-grid methods, leading to an improved method for the Morley element	55
Z. Belhachmi and F. Ben Belgacem , Quadratic finite element approximation of the Signorini problem	83
L. Vardapetyan and L. Demkowicz , Full-wave analysis of dielectric waveguides at a given frequency	105
Ramaz Botchorishvili, Benoit Perthame, and Alexis Vasseur , Equilibrium schemes for scalar conservation laws with stiff sources	131
Yen-Hsi Richard Tsai, Yoshikazu Giga, and Stanley Osher , A level set approach for computing discontinuous solutions of Hamilton-Jacobi equations	159
Albert Cohen, Sidi Mahmoud Kaber, Siegfried Müller, and Marie Postel , Fully adaptive multiresolution finite volume schemes for conservation laws	183
Hailiang Liu , The l^1 global decay to discrete shocks for scalar monotone schemes	227
A. J. Roberts , A holistic finite difference approach models linear dynamics consistently	247
Howard C. Elman and Alison Ramage , A characterisation of oscillations in the discrete two-dimensional convection-diffusion equation	263
Othmar Koch and Ewa B. Weinmüller , The convergence of shooting methods for singular boundary value problems	289
Lung-An Ying , Convergence study of the Chorin-Marsden formula	307
Ming-Jun Lai and Larry L. Schumaker , Macro-elements and stable local bases for splines on Powell-Sabin triangulations	335
Marko Huhtanen , Orthogonal polyanalytic polynomials and normal matrices	355
Tai-Lin Wang and William B. Gragg , Convergence of the unitary QR algorithm with a unimodular Wilkinson shift	375
Colin Percival , Rapid multiplication modulo the sum and difference of highly composite numbers	387
Enrique González-Jiménez and Josep González , Modular curves of genus 2	397
Avram Sidi , A convergence and stability study of the iterated Lubkin transformation and the θ -algorithm	419
Annegret Weng , Constructing hyperelliptic curves of genus 2 suitable for cryptography	435

Reinhold Hübl and Irena Swanson , Normal cones of monomial primes	459
Berit Skjærnaa , Satoh's algorithm in characteristic 2	477
Patrick J. Costello , New amicable pairs of type (2, 2) and type (3, 2)	489
Michael J. Jacobson, Jr. and Hugh C. Williams , New quadratic polynomials with high densities of prime values	499
A. J. van der Poorten, H. J. J. te Riele, and H. C. Williams , Corrigenda and addition to "Computer verification of the Ankeny-Artin-Chowla conjecture for all primes less than 100 000 000 000"	521

Vol. 72, No. 242

April 2003

So-Hsiang Chou, Do Y. Kwak, and Kwang Y. Kim , Mixed finite volume methods on nonstaggered quadrilateral grids for elliptic problems	525
Zhiming Chen and Thomas Y. Hou , A mixed multiscale finite element method for elliptic problems with oscillating coefficients	541
Bernardo Cockburn, Mitchell Luskin, Chi-Wang Shu, and Endre Süli , Enhanced accuracy by post-processing for finite element methods for hyperbolic equations	577
Yuki Matsuzawa, Takashi Suzuki, and Takuya Tsuchiya , Finite element approximation of H-surfaces	607
T. P. Mathew and G. Russo , Maximum norm stability of difference schemes for parabolic equations on overset nonmatching space-time grids	619
Ping Lin , Theoretical and numerical analysis for the quasi-continuum approximation of a material particle model	657
Gerard L. G. Sleijpen, Jasper van den Eshof, and Paul Smit , Optimal a priori error bounds for the Rayleigh-Ritz method	677
Michael S. Floater , One-to-one piecewise linear mappings over triangulations	685
M. N. Spijker, S. Tracogna, and B. D. Welfert , About the sharpness of the stability estimates in the Kreiss matrix theorem	697
Ren-Cang Li , On perturbations of matrix pencils with real spectra, a revisit	715
Sheon-Young Kang, Israel Koltracht, and George Rawitscher , Nyström-Clenshaw-Curtis quadrature for integral equations with discontinuous kernels	729
Jianwei Dian and R. Baker Kearfott , Existence verification for singular and nonsmooth zeros of real nonlinear systems	757
Masaaki Sugihara , Near optimality of the sinc approximation	767
Peter Borwein and Michael J. Mossinghoff , Newman polynomials with prescribed vanishing and integer sets with distinct subset sums	787
Shuhong Gao , Factoring multivariate polynomials via partial differential equations	801
Xiaoqun Wang , Strong tractability of multivariate integration using quasi-Monte Carlo algorithms	823

Oliver D. King , A mass formula for unimodular lattices with no roots ...	839
Takeyoshi Kogiso, Go Miyabe, Miyuki Kobayashi, and Tatsuo Kimura , Relative invariants of some 2-simple prehomogeneous vector spaces	865
Marc Conrad and Daniel R. Replogle , Nontrivial Galois module structure of cyclotomic fields	891
Qiang Wu , On the linear independence measure of logarithms of rational numbers	901
René Schoof , Class numbers of real cyclotomic fields of prime conductor ..	913
Mariano Garcia , The first known type (7, 1) amicable pair	939
Henri Cohen, Francisco Diaz y Diaz, and Michel Olivier , Constructing complete tables of quartic fields using Kummer theory	941
Antoine Joux and Reynald Lercier , Improvements to the general number field sieve for discrete logarithms in prime fields. A comparison with the gaussian integer method	953
Tsuyoshi Itoh , A computation of minimal polynomials of special values of Siegel modular functions	969
J. William Hoffman, James J. Madden, and Hong Zhang , Pseudozeros of multivariate polynomials	975
Ku-Young Chang and Soun-Hi Kwon , The class number one problem for some non-abelian normal CM-fields of degree 48	1003
Richard Blecksmith and John Brillhart , Linear quintuple-product identities	1019
David Applegate and Jeffrey C. Lagarias , Lower bounds for the total stopping time of $3x + 1$ iterates	1035
Giovanni Resta and Jean-Charles Meyrignac , The smallest solutions to the diophantine equation $x^6 + y^6 = a^6 + b^6 + c^6 + d^6 + e^6$	1051
Reviews and Descriptions of Tables and Books	1055
R. Wong 1, D. Estep and S. Tavener, Editors 2	

Vol. 72, No. 243

July 2003

Yunqing Huang and Jinchao Xu , A conforming finite element method for overlapping and nonmatching grids	1057
Pedro Morin, Ricardo H. Nochetto, and Kunibert G. Siebert , Local problems on stars: A posteriori error estimators, convergence, and performance	1067
Erwin Hernández and Rodolfo Rodríguez , Finite element approximation of spectral problems with Neumann boundary conditions on curved domains	1099
F. Ben Belgacem and Y. Renard , Hybrid finite element methods for the Signorini problem	1117
Zhimin Zhang , Finite element superconvergence on Shishkin mesh for 2-D convection-diffusion problems	1147

Ilaria Perugia and Dominik Schötzau , The hp -local discontinuous Galerkin method for low-frequency time-harmonic Maxwell equations .	1179
Caroline Lasser and Andrea Toselli , An overlapping domain decomposition preconditioner for a class of discontinuous Galerkin approximations of advection-diffusion problems	1215
Robert Kirby , On the convergence of high resolution methods with multiple time scales for hyperbolic conservation laws	1239
Günther Grün , On the convergence of entropy consistent schemes for lubrication type equations in multiple space dimensions	1251
R. Hiptmair , Analysis of multilevel methods for eddy current problems ..	1281
S. Serra Capizzano and E. Tyrtshnikov , How to prove that a preconditioner cannot be superlinear	1305
Yu-Hong Dai , A family of hybrid conjugate gradient methods for unconstrained optimization	1317
A. Böttcher, M. Embree, and V. I. Sokolov , The spectra of large Toeplitz band matrices with a randomly perturbed entry	1329
Jungho Yoon , L_p -error estimates for “shifted” surface spline interpolation on Sobolev space	1349
Xuli Han , Piecewise quadratic trigonometric polynomial curves	1369
Rick Kreminski , Newton-Cotes integration for approximating Stieltjes (generalized Euler) constants	1379
Andreas Rieder and Thomas Schuster , The approximate inverse in action II: convergence and stability	1399
J. E. Cremona and D. Rusin , Efficient solution of rational conics	1417
Richard P. Brent, Samuli Larvala, and Paul Zimmermann , A fast algorithm for testing reducibility of trinomials mod 2 and some new primitive trinomials of degree 3021377	1443
Josef Leydold , Short universal generators via generalized ratio-of-uniforms method	1453
Nick A. Howgrave-Graham, Phong Q. Nguyen, and Igor E. Shparlinski , Hidden number problem with hidden multipliers, timed-release crypto, and noisy exponentiation	1473
Gregory P. Dresden , Sums of heights of algebraic numbers	1487
Hong You and Sheng Chen , The tame kernel of imaginary quadratic fields with class number 2 or 3	1501
Bettina Eick and Gretchen Ostheimer , On the orbit-stabilizer problem for integral matrix actions of polycyclic groups	1511
Florian Heß, Sebastian Pauli, and Michael E. Pohst , Computing the multiplicative group of residue class rings	1531
Paul M. Jenkins , Odd perfect numbers have a prime factor exceeding 10^7	1549
Richard E. Crandall, Ernst W. Mayer, and Jason S. Papadopoulos , The twenty-fourth Fermat number is composite	1555
Reviews and Descriptions of Tables and Books	1573

Constantin Bacuta, James H. Bramble, and Jinchao Xu, Regularity estimates for elliptic boundary value problems in Besov spaces	1577
Nikolai Yu. Bakaev, Vidar Thomée, and Lars B. Wahlbin, Maximum-norm estimates for resolvents of elliptic finite element operators	1597
Francesca Fierro and Andreas Veerer, On the a posteriori error analysis for equations of prescribed mean curvature	1611
Ville Havu and Juhani Pitkäranta, Analysis of a bilinear finite element for shallow shells. II: Consistency error	1635
Tianxiao Zhou, Stabilized hybrid finite element methods based on the combination of saddle point principles of elasticity problems	1655
Bo Li, Finite element analysis of a class of stress-free martensitic microstructures	1675
Song Wang and Zi-Cai Li, A nonconforming combination of the finite element and volume methods with an anisotropic mesh refinement for a singularly perturbed convection-diffusion equation	1689
Barbara Kaltenbacher, V-cycle convergence of some multigrid methods for ill-posed problems	1711
Xu-Dong Liu and Thomas C. Sideris, Convergence of the ghost fluid method for elliptic equations with interfaces	1731
Kirill Kopotun, Marian Neamtu, and Bojan Popov, Weakly nonoscillatory schemes for scalar conservation laws	1747
B. Cano and A. Durán, Analysis of variable-stepsize linear multistep methods with special emphasis on symmetric ones	1769
B. Cano and A. Durán, A technique to construct symmetric variable-stepsize linear multistep methods for second-order systems	1803
Philippe P. Pébay and Timothy J. Baker, Analysis of triangle quality measures	1817
S.-H. Lui, A pseudospectral mapping theorem	1841
Gradimir V. Milovanović and Miodrag M. Spalević, Error bounds for Gauss-Turán quadrature formulae of analytic functions	1855
Scott N. Kersey, On the problems of smoothing and near-interpolation ..	1873
Peter Fleischmann, Markus Chr. Holder, and Peter Roelse, The black-box Niederreiter algorithm and its implementation over the binary field	1887
P. B. Borwein, C. G. Pinner, and I. E. Pritsker, Monic integer Chebyshev problem	1901
R. J. Stroeker and N. Tzanakis, Computing all integer solutions of a genus 1 equation	1917
Alfred J. van der Poorten, A note on NUCOMP	1935
Roger Alexander, Index-doubling in sequences by Aitken extrapolation ..	1947
W. Bley, Computation of Stark-Tamagawa units	1963
John W. Jones and David P. Roberts, Septic fields with discriminant $\pm 2^a 3^b$	1975
Joachim von zur Gathen, Irreducible trinomials over finite fields	1987
M. K. Bos, Coding the principal character formula for affine Kac-Moody Lie algebras	2001

Klaus Bongartz and Thomas Fritzsche , On minimal disjoint degenerations for preprojective representations of quivers	2013
A. Stoimenow , On the unknotting number of minimal diagrams	2043
Jeffrey J. Holt , The minimal number of solutions to $\phi(n) = \phi(n + k)$	2059
Peter Borwein, Petr Lisoněk, and Colin Percival , Computational investigations of the Prouhet-Tarry-Escott Problem	2063
Karsten Blankenagel, Walter Borho, and Axel vom Stein , New amicable four-cycles	2071
D. E. Iannucci and R. M. Sorli , On the total number of prime factors of an odd perfect number	2077
Zhenxiang Zhang and Min Tang , Finding strong pseudoprimes to several bases. II	2085
M. J. Jacobson, Jr., Á. Pintér, and P. G. Walsh , A computational approach for solving $y^2 = 1^k + 2^k + \cdots + x^k$	2099

Editorial Information

As of May 31, 2003, the backlog for this journal was approximately 3 issues. 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). 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. An author should submit the manuscript by e-mail to `mathcomp@dam.brown.edu`. The manuscript should be sent as a single postscript or pdf file. Files can be compressed using zip or gzip making the files smaller in size. If e-mail submission is not feasible, three paper copies should be submitted. If the office of the Managing Editor is not able to print the file received from an e-mail submission, the author will be contacted and asked to send three paper copies instead. The author may suggest an appropriate editor for his or her paper. All paper copies of contributions and all books for review should be addressed to Chi-Wang Shu, Managing Editor, Mathematics of Computation, Division of Applied Mathematics, Brown University, 182 George Street, Providence, RI 02912 USA. The date received, which is published with the final version of an accepted paper, is the date received in the office of the Managing Editor, and it is the responsibility of the author to submit manuscripts directly to this office.

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 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. For the final submission of accepted papers, the AMS encourages use of electronically prepared manuscripts, with a strong preference for $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$. To this end, the Society has prepared $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 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 $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ style file and the `\label` and `\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 $\mathcal{T}\mathcal{E}\mathcal{X}$, using $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 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. $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ papers also move more efficiently through the production stream, helping to minimize publishing costs.

$\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ is the highly preferred format of $\mathcal{T}\mathcal{E}\mathcal{X}$, but author packages are also available in $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$. 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 $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ or plain $\mathcal{T}\mathcal{E}\mathcal{X}$ 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. $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ users will find that $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ is the same as $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ with additional commands to simplify the typesetting of mathematics, and users of plain $\mathcal{T}\mathcal{E}\mathcal{X}$ should have the foundation for learning $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$.

Authors may retrieve an author package from the AMS website starting from www.ams.org/tex/ or via FTP to [ftp.ams.org](ftp://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 $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ or $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{T}\mathcal{E}\mathcal{X}$, Macintosh or IBM (3.5) format, and the publication in which your paper will appear. Please be sure to include your complete mailing address.

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 Managing 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 email to pub-submit@ams.org (Internet) or on diskette to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When sending a manuscript electronically, 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/ 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 mcom-query@ams.org.

T_EX 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*, T_EX files can be downloaded from the AMS website, starting from 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, T_EX 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 T_EX 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 T_EX production at the AMS sometimes requires extra fonts and macros that are not yet publicly available, T_EX files cannot be guaranteed to run through the author’s version of T_EX without errors. The AMS regrets that it cannot provide support to eliminate such errors in the author’s T_EX 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 mcom-query@ams.org or directly to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

Editorial Committee

RENÉ SCHOOF, Dipartimento di Matematica, 2a Università di Roma “Tor Vergata”, I-00133 Roma, Italy; *E-mail:* schoof@wins.uva.nl

CHI-WANG SHU, Chair. Applied Mathematics Division, Brown University, P.O. Box F, 182 George St., Providence, RI 02912-0001 USA; *E-mail:* mathcomp@dam.brown.edu

LARS B. WAHLBIN, Center for Applied Mathematics, 657 Frank H. T. Rhodes Hall, Cornell University, Ithaca, NY 14853-3801 USA; *E-mail:* awahlbin@cam.cornell.edu

JOSEPH D. WARD, Department of Mathematics, Texas A&M University, College Station, TX 77843-3368 USA; *E-mail:* jward@math.tamu.edu

Board of Associate Editors

RANDOLPH E. BANK, Department of Mathematics, University of California San Diego, C-012, La Jolla, CA 92093-0001 USA; *E-mail:* reb@sdna2.ucsd.edu

CHRISTINE BERNARDI, Laboratoire d'Analyse Numerique, C.N.R.S. et Université Pierre et Marie Curie, B.C. 187, 4 place Jussieu, 75252 Paris Cedex 05, France; *E-mail*: bernardi@ann.jussieu.fr

DAVID W. BOYD, Department of Mathematics, University of British Columbia, Vancouver, BC Canada V6T 1Z2; *E-mail*: boyd@math.ubc.ca

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

RICHARD P. BRENT, Oxford University Computing Laboratory, Wolfson Building, Parks Road, Oxford OX1 3QD, England; *E-mail*: Richard.Brent@comlab.ox.ac.uk

JOE P. BUHLER, Mathematical Sciences, Research Institute, 1000 Centennial Drive, Berkeley, CA 94720-5070 USA; *E-mail*: jpb@msri.org

CARSTEN CARSTENSEN, Mathematisches Seminar, Christian-Albrechts-Universität zu Kiel, Ludewig-Meyn-Straße 4, D-24098 Kiel, Germany; *E-mail*: cc@numerik.uni-kiel.de

ARJEH M. COHEN, Faculteit Wiskunde en Informatica, TU Eindhoven, Postbus 513, 5600 MB Eindhoven, Netherlands; *E-mail*: amc@win.tue.nl

RONALD F. A. COOLS, Department of Computer Science, Katholieke Universiteit Leuven, Celestijnenlaan 200A, B-3001 Heverlee, Belgium; *E-mail*: ronald.cools@cs.kuleuven.ac.be

HOWARD ELMAN, Department of Computer Science, University of Maryland, College Park, MD 20742-0001 USA; *E-mail*: elman@cs.umd.edu

RICHARD S. FALK, Department of Mathematics, Rutgers University, Hill Center, 110 Frelinghuysen Road, Piscataway, NJ 08854-8019 USA; *E-mail*: falk@math.rutgers.edu

DANIEL W. LOZIER, National Institute of Standards and Technology, 100 Bureau Drive, Mail Stop 8910, Gaithersburg, MD 20899-8910 USA; *E-mail*: dlozier@nist.gov

ZHI-QUAN LUO, Department of Electrical and Computer Engineering, McMaster University, Room CRL/225, Hamilton, ON Canada L8S 4K1; *E-mail*: luozq@mcmail.cis.mcmaster.ca

HARALD NIEDERREITER, Department of Mathematics, National University of Singapore, 2 Science Drive 2, Singapore 117543, Republic of Singapore; *E-mail*: nied@math.nus.edu.sg

RICARDO H. NOCHETTO, Department of Mathematics, University of Maryland, Mathematics Building 084, College Park, MD 20742-0001 USA; *E-mail*: rhn@math.umd.edu

STANLEY OSHER, Department of Mathematics, University of California, P.O. Box 951555, Los Angeles, CA 90095-1555 USA; *E-mail*: sjo@math.ucla.edu

HAESUN PARK, Department of Computer Science, University of Minnesota, 4-192 EE/CS, 200 Union Street, Minneapolis, MN 55455 USA; *E-mail*: hpark@cs.umn.edu

JOSEPH E. PASCIAK, Department of Mathematics, Texas A&M University, 507B Blocker Hall, MS 3368, College Station, TX 77843 USA; *E-mail*: pasciak@math.tamu.edu

LOTHAR REICHEL, Department of Mathematics & Computer Science, Kent State University, P.O. Box 5190, Kent, OH 44242-0001 USA; *E-mail*: reichel@mcs.kent.edu

IGOR E. SHPARLINSKI, Department of Computing, Macquarie University, Sydney, New South Wales 2109, Australia; *E-mail*: igor@comp.mq.edu.au

FRANK STENGER, School of Computing, University of Utah, Salt Lake City, UT 84112-1102 USA; *E-mail*: stenger@cs.utah.edu

DENIS TALAY, INRIA, 2004 Route des Lucioles, BP 93, 06902 Sophia Antipolis Cedex, France; *E-mail*: talay@sophia.inria.fr

NICO M. TEMME, Centrum voor Wiskunde en Informatica, P.O. Box 94079, 1090-GB Amsterdam, Netherlands; *E-mail*: nicot@cwii.nl

HUGH C. WILLIAMS, Department of Mathematics and Statistics, University of Calgary, Calgary AB, Canada T2N 1N4; *E-mail*: williams@math.ucalgary.ca

JINCHAO XU, Department of Mathematics, Pennsylvania State University, McAllister Building, University Park, PA 16802-6401 USA; *E-mail*: xu@math.psu.edu

(Continued from back cover)

Alfred J. van der Poorten , A note on NUCOMP	1935
Roger Alexander , Index-doubling in sequences by Aitken extrapolation .	1947
W. Bley , Computation of Stark-Tamagawa units	1963
John W. Jones and David P. Roberts , Septic fields with discriminant $\pm 2^a 3^b$	1975
Joachim von zur Gathen , Irreducible trinomials over finite fields	1987
M. K. Bos , Coding the principal character formula for affine Kac-Moody Lie algebras	2001
Klaus Bongartz and Thomas Fritzsche , On minimal disjoint degenerations for preprojective representations of quivers	2013
A. Stoimenow , On the unknotting number of minimal diagrams	2043
Jeffrey J. Holt , The minimal number of solutions to $\phi(n) = \phi(n+k)$	2059
Peter Borwein, Petr Lisoněk, and Colin Percival , Computational investigations of the Prouhet-Tarry-Escott Problem	2063
Karsten Blankenagel, Walter Borho, and Axel vom Stein , New amicable four-cycles	2071
D. E. Iannucci and R. M. Sorli , On the total number of prime factors of an odd perfect number	2077
Zhenxiang Zhang and Min Tang , Finding strong pseudoprimes to several bases. II	2085
M. J. Jacobson, Jr., Á. Pintér, and P. G. Walsh , A computational approach for solving $y^2 = 1^k + 2^k + \cdots + x^k$	2099

No microfiche supplement in this issue

MATHEMATICS OF COMPUTATION

CONTENTS

Vol. 72, No. 244

October 2003

Constantin Bacuta, James H. Bramble, and Jinchao Xu , Regularity estimates for elliptic boundary value problems in Besov spaces	1577
Nikolai Yu. Bakaev, Vidar Thomée, and Lars B. Wahlbin , Maximum-norm estimates for resolvents of elliptic finite element operators	1597
Francesca Fierro and Andreas Veiser , On the a posteriori error analysis for equations of prescribed mean curvature	1611
Ville Havu and Juhani Pitkäranta , Analysis of a bilinear finite element for shallow shells. II: Consistency error	1635
Tianxiao Zhou , Stabilized hybrid finite element methods based on the combination of saddle point principles of elasticity problems	1655
Bo Li , Finite element analysis of a class of stress-free martensitic microstructures	1675
Song Wang and Zi-Cai Li , A nonconforming combination of the finite element and volume methods with an anisotropic mesh refinement for a singularly perturbed convection-diffusion equation	1689
Barbara Kaltenbacher , V-cycle convergence of some multigrid methods for ill-posed problems	1711
Xu-Dong Liu and Thomas C. Sideris , Convergence of the ghost fluid method for elliptic equations with interfaces	1731
Kirill Kopotun, Marian Neamtu, and Bojan Popov , Weakly nonoscillatory schemes for scalar conservation laws	1747
B. Cano and A. Durán , Analysis of variable-stepsize linear multistep methods with special emphasis on symmetric ones	1769
B. Cano and A. Durán , A technique to construct symmetric variable-stepsize linear multistep methods for second-order systems	1803
Philippe P. Pébay and Timothy J. Baker , Analysis of triangle quality measures	1817
S.-H. Lui , A pseudospectral mapping theorem	1841
Gradimir V. Milovanović and Miodrag M. Spalević , Error bounds for Gauss-Turán quadrature formulae of analytic functions	1855
Scott N. Kersey , On the problems of smoothing and near-interpolation	1873
Peter Fleischmann, Markus Chr. Holder, and Peter Roelse , The black-box Niederreiter algorithm and its implementation over the binary field	1887
P. B. Borwein, C. G. Pinner, and I. E. Pritsker , Monic integer Chebyshev problem	1901
R. J. Stroeker and N. Tzanakis , Computing all integer solutions of a genus 1 equation	1917

(Continued on inside back cover)



0025-5718(200310)72:244*;1-6