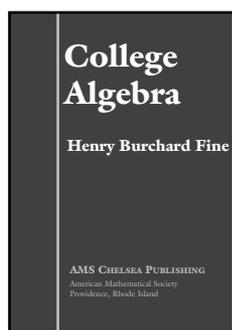


New Publications Offered by the AMS

Algebra and Algebraic Geometry



College Algebra Henry Burchard Fine

From a review of the previous edition:

This book contains more than would seem possible from the title ... the author demonstrates that he is taking pains to bring scientific rigor into accord with pedagogical considerations.

—translation of Jahrbuch Database review cited in Zbl. Reviews

At the beginning of the twentieth century, college algebra was taught differently than it is nowadays. There are many topics that are now part of calculus or analysis classes. Other topics are covered only in abstract form in a modern algebra class on field theory. Fine's *College Algebra* offers the reader a chance to learn the origins of a variety of topics taught in today's curriculum, while also learning valuable techniques that, in some cases, are almost forgotten.

In the early 1900s, *methods* were often emphasized, rather than abstract principles. In this book, Fine includes detailed discussions of techniques of solving quadratic and cubic equations, as well as some discussion of fourth-order equations. There are also detailed treatments of partial fractions, the method of undetermined coefficients, and synthetic division.

The book is ostensibly an algebra book; however, it covers many topics that are found throughout today's curriculum:

- calculus and analysis: infinite series, partial fractions, undetermined coefficients, properties of continuous functions,
- number theory: continued fractions,
- probability: basic results in probability.

Though the book is structured as a textbook, modern mathematicians will find it a delight to dip into. There are many gems that have been overlooked by today's emphasis on abstraction and generality. By revisiting familiar topics, such as continued fractions or solutions of polynomial equations, modern readers will enrich their knowledge of fundamental areas of mathematics, while gaining concrete methods for

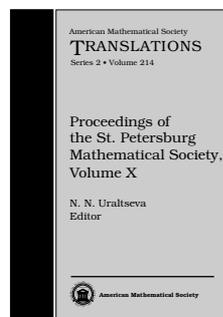
working with their modern incarnations. The book is suitable for undergraduates, graduate students, and researchers interested in algebra.

Contents: *Numbers:* The natural numbers—counting, addition, and multiplication; Subtraction and the negative; Division and fractions; Irrational numbers; The imaginary and complex numbers; *Algebra:* Preliminary considerations; The fundamental operations; Simple equations in one unknown letter; Systems of simultaneous simple equations; The division transformation; Factors of rational integral expressions; Highest common factor and lowest common multiple; Rational fractions; Symmetric functions; The binomial theorem; Evolution; Irrational functions. Radicals and fractional exponents; Quadratic equations; A discussion of the quadratic equation. Maxima and minima; Equations of higher degree which can be solved by means of quadratics; Simultaneous equations which can be solved by means of quadratics; Inequalities; Indeterminate equations of the first degree; Ratio and proportion. Variation; Arithmetical progression; Geometrical progression; Harmonical progression; Method of differences. Arithmetical progressions of higher orders. Interpolation; Logarithms; Permutations and combinations; The multinomial theorem; Probability; Mathematical induction; Theory of equations; The general cubic and biquadratic equations; Determinants and elimination; Convergence of infinite series; Operations with infinite series; The binomial, exponential, and logarithmic series; Recurring series; Infinite products; Continued fractions; Properties of continuous functions; Answers; Index.

AMS Chelsea Publishing

October 2005, 631 pages, Hardcover, ISBN 0-8218-3863-6, LC 2005048172, 2000 *Mathematics Subject Classification:* 12-01, 40-01, **All AMS members US\$62**, List US\$69, Order code CHEL/354.H

Analysis



Proceedings of the St. Petersburg Mathematical Society, Volume X

N. N. Uraltseva, *St. Petersburg State University, Russia*, Editor

This book contains articles on analysis, theory of functions, partial differential equations, representation theory, and other areas of

mathematics. It also includes two historical papers: an article about Professor G. I. Natanson and a note about the role of L. V. Kantorovich in developing computational mathematics in the Soviet Union.

The book is suitable for graduate students and researchers interested in analysis and differential equations. It has many articles of interest for a broad mathematical audience.

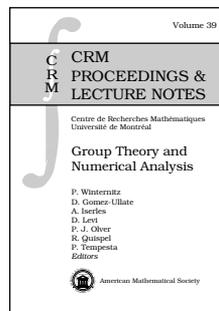
This item will also be of interest to those working in differential equations and general and interdisciplinary areas.

Contents: S. A. Avdonin and M. I. Belishev, Dynamical inverse problem for the Schrödinger equation (BC-method); G. A. Leonov and M. S. Poltinnikova, On the Lyapunov dimension of the attractor of the Chirikov dissipative mapping; A. I. Nazarov, On solutions to the Dirichlet problem for an equation with p -Laplacian in a spherical layer; S. A. Nazarov and A. S. Slutskii, Asymptotic analysis of an arbitrary spatial system of thin rods; N. I. Nessonov, Kubo-Martin-Schwinger states on the group $GL(\infty)$ and admissible representations of $GL(\infty)^X$; S. Yu. Pilyugin, C^1 -version of Arnold's conjecture about limit sets of domains; B. A. Samokish, H_2 -optimal quadrature formula with Chebyshev weight of the second kind: Estimate for the remainder term; O. V. Sarafanov, Calculus of pseudodifferential boundary value problems on manifolds with smooth edges; O. L. Vinogradov, V. V. Zhuk, V. L. Faïnshmidt, and V. P. Khavin, Garal'd Isidorovich Natanson; I. K. Daugavet, V. M. Ryabov, and B. A. Samokish, Leonid Vital'evich Kantorovich and computational mathematics.

American Mathematical Society Translations—Series 2, Volume 214

September 2005, 257 pages, Hardcover, ISBN 0-8218-3861-X, 2000 *Mathematics Subject Classification*: 00B55, All AMS members US\$87, List US\$109, Order code TRANS2/214

Differential Equations



Group Theory and Numerical Analysis

P. Winternitz, *Université de Montréal, QC, Canada*, D. Gomez-Ullate, *Universitat Politècnica de Catalunya, Barcelona, Spain*, A. Iserles, *University of Cambridge, UK*, D. Levi, *Università degli Studi Roma, Italy*, P. J. Olver, *University of Minnesota,*

Minneapolis, MN, R. Quispel, *La Trobe University, Victoria, Australia*, and P. Tempesta, *Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste, Italy*, Editors

The Workshop on Group Theory and Numerical Analysis brought together scientists working in several different but related areas. The unifying theme was the application of group theory and geometrical methods to the solution of differential and difference equations. The emphasis was on the combination of analytical and numerical methods and also the use of symbolic computation. This meeting was organized under the auspices of the Centre de Recherches Mathématiques, Université de Montréal (Canada).

This volume has the character of a monograph and should represent a useful reference book for scientists working in this highly topical field.

This item will also be of interest to those working in algebra and algebraic geometry.

Contents: A. M. Atoyan and J. Patera, Continuous extension of the discrete cosine transform, and its applications to data processing; D. Baldwin, W. Hereman, and J. Sayers, Symbolic algorithms for the Painlevé test, special solutions, and recursion operators for nonlinear PDEs; C. M. Bender, Continuum limit of lattice approximation schemes; H. Berland and B. Owren, Algebraic structures on ordered rooted trees and their significance to Lie group integrators; A. M. Bloch and A. Iserles, Aspects of generalized double-bracket flows; E. Celledoni, Eulerian and semi-Lagrangian schemes based on commutator-free exponential integrators; E. S. Cheb-Terrab, Second order linear ODEs: Two non-Liouvillian approaches; P. A. Clarkson, On rational solutions of the fourth Painlevé equation and its Hamiltonian; C. Cyr-Gagnon, Comparison of symmetry preserving difference schemes with standard numerical methods; W. Hereman, J. A. Sanders, J. Sayers, and J. P. Wang, Symbolic computation of polynomial conserved densities, generalized symmetries, and recursion operators for nonlinear differential-difference equations; A. Iserles, On the numerical analysis of rapid oscillation; R. Kozlov, On conservation properties of semidiscrete canonical Hamiltonian equations; D. Levi and M. A. Rodriguez, Discrete Lie symmetries for difference equations; D. Lewis, Trivializations, factorizations, and geometric integration for pseudo-rigid bodies; E. L. Mansfield and G. R. W. Quispel, Towards a variational complex for the finite element method;

J. Middleton and **J. A. Tuszynski**, Models of resonantly driven motion of motor proteins in 2D potentials; **J. Bonasia**, **F. Lemaire**, **G. Reid**, **R. Scott**, and **L. Zhi**, Determination of approximate symmetries of differential equations; **K. B. Wolf**, Discrete and finite fractional Fourier transform; **W. J. Zakrzewski**, Some nanotube-like systems and their discrete equations; **A. Zhedanov**, Explicit multipoint rational interpolation Padé table for exponential and power functions.

CRM Proceedings & Lecture Notes, Volume 39

October 2005, approximately 320 pages, Softcover, ISBN 0-8218-3565-3, 2000 *Mathematics Subject Classification*: 34-06, 35-06; 20-06, 39-06, All AMS members US\$79, List US\$99, Order code CRMP/39

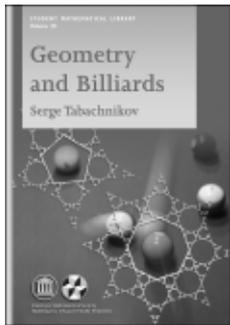
This item will also be of interest to those working in differential equations.

Contents: Motivation: Mechanics and optics; Billiard in the circle and the square; Billiard ball map and integral geometry; Billiards inside conics and quadrics; Existence and non-existence of caustics; Periodic trajectories; Billiards in polygons; Chaotic billiards; Dual billiards; Bibliography; Index.

Student Mathematical Library, Volume 30

October 2005, 176 pages, Softcover, ISBN 0-8218-3919-5, 2000 *Mathematics Subject Classification*: 37-02, 51-02; 49-02, 70-02, 78-02, All AMS members US\$28, List US\$35, Order code STML/30

Geometry and Topology



Geometry and Billiards

Serge Tabachnikov, Penn State, University Park, PA

Mathematical billiards describe the motion of a mass point in a domain with elastic reflections off the boundary or, equivalently, the behavior of rays of light in a domain with ideally reflecting boundary. From the point of view of differential

geometry, the billiard flow is the geodesic flow on a manifold with boundary. This book is devoted to billiards in their relation with differential geometry, classical mechanics, and geometrical optics.

Topics covered include variational principles of billiard motion, symplectic geometry of rays of light and integral geometry, existence and nonexistence of caustics, optical properties of conics and quadrics and completely integrable billiards, periodic billiard trajectories, polygonal billiards, mechanisms of chaos in billiard dynamics, and the lesser-known subject of dual (or outer) billiards.

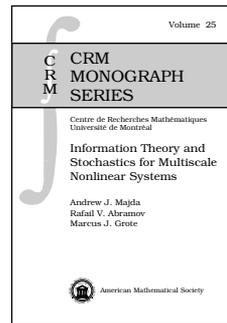
The book is based on an advanced undergraduate topics course. Minimum prerequisites are the standard material covered in the first two years of college mathematics (the entire calculus sequence, linear algebra). However, readers should show some mathematical maturity and rely on their mathematical common sense.

A unique feature of the book is the coverage of many diverse topics related to billiards, for example, evolutes and involutes of plane curves, the four-vertex theorem, a mathematical theory of rainbows, distribution of first digits in various sequences, Morse theory, the Poincaré recurrence theorem, Hilbert's fourth problem, Poncelet porism, and many others. There are approximately 100 illustrations.

The book is suitable for advanced undergraduates, graduate students, and researchers interested in ergodic theory and geometry.

This volume has been copublished with the Mathematics Advanced Study Semesters program at Penn State.

Probability



Information Theory and Stochastics for Multiscale Nonlinear Systems

Andrew J. Majda and Rafail V. Abramov, Courant Institute of Mathematical Sciences, New York University, NY, and Marcus J. Grote, University of Basel, Switzerland

This book introduces mathematicians to the fascinating mathematical interplay between ideas from stochastics and information theory and practical issues in studying complex multiscale nonlinear systems. It emphasizes the serendipity between modern applied mathematics and applications where rigorous analysis, the development of qualitative and/or asymptotic models, and numerical modeling all interact to explain complex phenomena.

After a brief introduction to the emerging issues in multiscale modeling, the book has three main chapters. The first chapter is an introduction to information theory with novel applications to statistical mechanics, predictability, and Jupiter's Red Spot for geophysical flows. The second chapter discusses new mathematical issues regarding fluctuation-dissipation theorems for complex nonlinear systems including information flow, various approximations, and illustrates applications to various mathematical models. The third chapter discusses stochastic modeling of complex nonlinear systems. After a general discussion, a new elementary model, motivated by issues in climate dynamics, is utilized to develop a self-contained example of stochastic mode reduction.

Based on A. Majda's Aisenstadt lectures at the University of Montreal, the book is appropriate for both pure and applied mathematics graduate students, postdocs and faculty, as well as interested researchers in other scientific disciplines. No background in geophysical flows is required.

About the authors: *Andrew Majda* is a member of the National Academy of Sciences and has received numerous honors and awards, including the National Academy of Science

Prize in Applied Mathematics, the John von Neumann Prize of the Society of Industrial and Applied Mathematics, the Gibbs Prize of the American Mathematical Society, and the Medal of the College de France. In the past several years at the Courant Institute, Majda and a multi-disciplinary faculty have created the Center for Atmosphere Ocean Science to promote cross-disciplinary research with modern applied mathematics in climate modeling and prediction. *R.V. Abramov* is a young researcher; he received his PhD in 2002. *M. J. Grote* received his Ph.D. under Joseph B. Keller at Stanford University in 1995.

This item will also be of interest to those working in mathematical physics and applications.

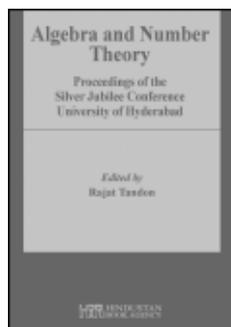
Contents: Overview on multiscale modeling in complex nonlinear systems; Information theory, predictability, Jupiter's great red spot, and equilibrium statistical mechanics; The fluctuation-dissipation theorem for complex nonlinear systems; Mathematical strategies for stochastic mode reduction in climate.

CRM Monograph Series, Volume 25

September 2005, 135 pages, Hardcover, ISBN 0-8218-3843-1, LC 2005050718, 2000 *Mathematics Subject Classification:* 60-XX; 62-XX, 76-XX, 82-XX, 86-XX, 94-XX, **All AMS members US\$31**, List US\$39, Order code CRMM/25

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Algebra and Number Theory

Rajat Tandon, *University of Hyderabad, India*, Editor

This volume contains refereed and updated versions of papers presented at the International Conference on Algebra and Number Theory held on the occasion of the silver jubilee of the School of Mathematics and Computer/Information Science at the University of Hyderabad (India). There

are three survey articles on topics as disparate as the cyclicity problem for division algebras, Ramanujan graphs and supplementary zeroes of p -adic L functions of modular forms. There are three articles that announce results and eighteen original contributions.

The section on algebra centers on recent work on quadratic forms and division algebras, though there are also papers on modules of Witt vectors, the Hodge-Tate conjecture, Calabi-Yau manifolds, and moduli stacks of vector bundles.

The section on number theory centers on automorphic forms and representations. However, here again, there are papers on other themes pertaining to elliptic curves and transcendental number theory.

This volume is suitable for young researchers, especially those interested in recent developments in the theory of quadratic and automorphic forms and representations.

This item will also be of interest to those working in number theory.

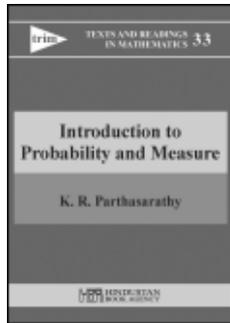
A publication of Hindustan Book Agency; distributed worldwide except in India by the AMS.

Contents: *Part I - Algebra:* **J.-L. Colliot-Thélène**, Fields of cohomological dimension one versus C_1 -fields; **F. Ischebeck** and **V. Kokot**, Modules of Witt vectors; **B. Kahn**, On "horizontal" invariants attached to quadratic forms; **L. Cardorin**, **M.-A. Knus**, and **M. Rost**, On the dimension and other numerical invariants of invariants of algebras and vector products; **I. Panin**, Purity for multipliers; **W. Raskind**, A generalized Hodge-Tate conjecture for algebraic varieties with totally degenerate reduction over p -adic fields; **D. J. Saltman**, The cyclicity question; **F. Neumann** and **U. Stuhler**, Moduli stacks of vector bundles and Frobenius morphisms; **R. Parimala** and **V. Suresh**, On the length of a quadratic form; **L. H. Rowen**, **A. S. Sivatski**, and **J.-P. Tignol**, Division algebras over rational function fields in one variable; *Part II - Number Theory:* **U. K. Anandavardhanan**, Distinguished non-archimedean representations; **P. Colmez**, Zéros supplémentaires de fonctions Lp -adiques de formes modulaires; **T. Geisser**, The cyclotomic trace map and values of zeta functions; **E. Ghate**, Ordinary forms and their local Galois representations; **J. Hakim**, Supercuspidal representations and symmetric spaces; **K. F. Lai** and **C. L. Zhao**, Overconvergent p -adic Siegel modular forms; **V. K. Murty**, Splitting of abelian varieties: a new local global problem; **M. R. Murty**, Ramanujan graphs and zeta functions; **C. S. Rajan**, Recovering modular forms and representations from tensor and symmetric powers; **K. Paranjpe** and **D. Ramakrishnan**, Quotients of En by a $n + 1$ and Calabi-Yau manifolds; **K. Hiraga** and **H. Saito**, On restriction of admissible representations; **J. Coates** and **R. Sujatha**, Fine Selmer groups for elliptic curves with complex multiplication; **M. Waldschmidt**, Variations on the Six Exponential Theorem; **H. Shiga**, Appendix: Periods on the Kummer surface; **T. Kashio** and **H. Yoshida**, On the p -adic absolute CM -period symbol.

Hindustan Book Agency

June 2005, 414 pages, Hardcover, ISBN 81-85931-57-7, 2000 *Mathematics Subject Classification:* 11Exx, 11Fxx, 11Gxx, 11Jxx, 11Rxx, 12Gxx, 14Gxx, 16Kxx, 22Exx, **All AMS members US\$53**, List US\$66, Order code HIN/23

Probability



Introduction to Probability and Measure

K. R. Parthasarathy, *Indian Statistical Institute, New Delhi, India*

According to a remark attributed to M. Kac, probability theory is measure theory with a soul. Furthermore, measure theory has its own ramifications in topics such as

function spaces, operator theory, generalized functions, ergodic theory, group representations, quantum probability, etc. On the other hand, recent explosive developments in the applications of probability theory have imposed the need for a good grasp of measure theory among a wide spectrum of scholars ranging from economists to engineers and physicists to psychologists. This book, with its choice of proofs, remarks, examples, and exercises, has been prepared by taking both these aesthetic and practical aspects into account. Courses based on this book will help undergraduate and graduate students in getting a firm grasp of the fundamentals in the twin themes of probability and measure theory.

This is a revised version of the book published earlier in 1977.

A publication of Hindustan Book Agency; distributed worldwide except in India by the AMS.

Contents: Probability of Boolean algebras; Extension of measures; Borel maps; Integration; Measures on product spaces; Hilbert space and conditional expectation; Weak convergence of probability measures; Invariant measures on groups.

Hindustan Book Agency

May 2005, 354 pages, Softcover, ISBN 81-85931-55-0, 2000 *Mathematics Subject Classification:* 60-01, 28-01, 60A10, 28C99, **All AMS members US\$29**, List US\$36, Order code HIN/24