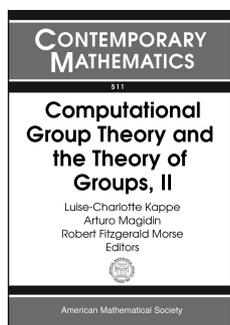


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Algebra and Algebraic Geometry



Computational Group Theory and the Theory of Groups, II

Luise-Charlotte Kappe,
Binghamton University, NY,
Arturo Magidin, *University of Louisiana at Lafayette, LA*,
and **Robert Fitzgerald Morse**,
University of Evansville, IN,
Editors

This volume consists of contributions by researchers who were invited to the Harlaxton Conference on Computational Group Theory and Cohomology, held in August of 2008, and to the AMS Special Session on Computational Group Theory, held in October 2008.

This volume showcases examples of how computational group theory can be applied to a wide range of theoretical aspects of group theory. Among the problems studied in this book are classification of p -groups, covers of Lie groups, resolutions of Bieberbach groups, and the study of the lower central series of free groups. This volume also includes expository articles on the probabilistic zeta function of a group and on enumerating subgroups of symmetric groups.

Researchers and graduate students working in all areas of group theory will find many examples of how computational group theory helps at various stages of the research process, from developing conjectures through the verification stage. These examples will suggest to the mathematician ways to incorporate computational group theory into their own research endeavors.

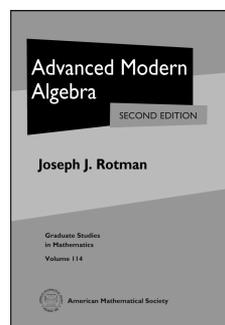
This item will also be of interest to those working in applications.

Contents: **B. Benesh**, The probabilistic Zeta function; **B. Eick** and **T. Rossmann**, Periodicities for graphs of p -groups beyond coclass; **G. Ellis**, **H. Mohammadzadeh**, and **H. Tavallaee**, Computing covers of Lie algebras; **D. F. Holt**, Enumerating subgroups of the symmetric group; **D. A. Jackson**, **A. M. Gaglione**, and **D. Spellman**, Weight five basic commutators as relators; **P. Moravec** and **R. F. Morse**, Basic commutators as relations: a computational perspective;

L.-C. Kappe and **G. Mendoza**, Groups of minimal order which are not n -power closed; **L.-C. Kappe** and **J. L. Redden**, On the covering number of small alternating groups; **A. Magidin** and **R. F. Morse**, Certain homological functors of 2-generator p -groups of class 2; **M. Röder**, Geometric algorithms for resolutions for Bieberbach groups; **F. Russo**, Nonabelian tensor product of soluble minimax groups; **J. Schmidt**, Finite groups have short rewriting systems.

Contemporary Mathematics, Volume 511

May 2010, 200 pages, Softcover, ISBN: 978-0-8218-4805-0, LC 2009047805, 2000 *Mathematics Subject Classification*: 20-06, 20B40, 20B35, 17B55, 18G10, 20F12, 20F18, 20H15, 20J99, 20P05, AMS members US\$55, List US\$69, Order code CONM/511



Advanced Modern Algebra

Second Edition

Joseph J. Rotman, *University of Illinois at Urbana-Champaign, IL*

About the First Edition:

...a highly welcome enhancement to the existing textbook literature in the field of algebra.

— Zentralblatt für Mathematik

This book is designed as a text for the first year of graduate algebra, but it can also serve as a reference since it contains more advanced topics as well. This second edition has a different organization than the first. It begins with a discussion of the cubic and quartic equations, which leads into permutations, group theory, and Galois theory (for finite extensions; infinite Galois theory is discussed later in the book). The study of groups continues with finite abelian groups (finitely generated groups are discussed later, in the context of module theory), Sylow theorems, simplicity of projective unimodular groups, free groups and presentations, and the Nielsen–Schreier theorem (subgroups of free groups are free).

The study of commutative rings continues with prime and maximal ideals, unique factorization, noetherian rings, Zorn's lemma and applications, varieties, and Gröbner bases. Next, noncommutative rings and modules are discussed, treating tensor product,

projective, injective, and flat modules, categories, functors, and natural transformations, categorical constructions (including direct and inverse limits), and adjoint functors. Then follow group representations: Wedderburn–Artin theorems, character theory, theorems of Burnside and Frobenius, division rings, Brauer groups, and abelian categories. Advanced linear algebra treats canonical forms for matrices and the structure of modules over PIDs, followed by multilinear algebra.

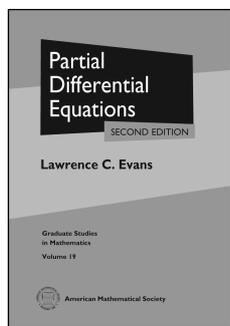
Homology is introduced, first for simplicial complexes, then as derived functors, with applications to Ext, Tor, and cohomology of groups, crossed products, and an introduction to algebraic K -theory. Finally, the author treats localization, Dedekind rings and algebraic number theory, and homological dimensions. The book ends with the proof that regular local rings have unique factorization.

Contents: Groups I; Commutative rings I; Fields; Groups II; Commutative rings II; Rings; Representation theory; Advanced linear algebra; Homology; Commutative rings III; Bibliography; Index.

Graduate Studies in Mathematics, Volume 114

August 2010, approximately 1015 pages, Hardcover, ISBN: 978-0-8218-4741-1, LC 2009052217, 2000 *Mathematics Subject Classification:* 11-XX, 12-XX, 13-XX, 15-XX, 16-XX, 18-XX, 19-XX, 20-XX, **AMS members US\$79**, List US\$99, Order code GSM/114

Differential Equations



Partial Differential Equations

Second Edition

Lawrence C. Evans, *University of California, Berkeley, CA*

This is the second edition of the now definitive text on partial differential equations (PDE). It offers a comprehensive survey of modern techniques in the

theoretical study of PDE with particular emphasis on nonlinear equations. Its wide scope and clear exposition make it a great text for a graduate course in PDE. For this edition, the author has made numerous changes, including

- a new chapter on nonlinear wave equations
- more than 80 new exercises
- several new sections
- a significantly expanded bibliography

About the First Edition:

I have used this book for both regular PDE and topics courses. It has a wonderful combination of insight and technical detail. ... Evans' book is evidence of his mastering of the field and the clarity of presentation.

—Luis Caffarelli, *University of Texas*

It is fun to teach from Evans' book. It explains many of the essential ideas and techniques of partial differential equations ... Every graduate student in analysis should read it.

—David Jerison, *MIT*

I use Partial Differential Equations to prepare my students for their Topic exam, which is a requirement before starting working on their dissertation. The book provides an excellent account of PDE's ... I am very happy with the preparation it provides my students.

—Carlos Kenig, *University of Chicago*

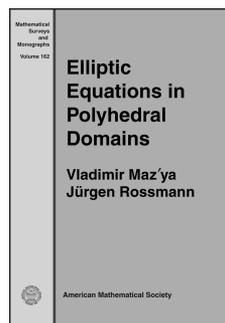
Evans' book has already attained the status of a classic. It is a clear choice for students just learning the subject, as well as for experts who wish to broaden their knowledge ... An outstanding reference for many aspects of the field.

—Rafe Mazzeo, *Stanford University*

Contents: Introduction; *Representation formulas for solutions:* Four important linear partial differential equations; Nonlinear first-order PDE; Other ways to represent solutions; *Theory for linear partial differential equations:* Sobolev spaces; Second-order elliptic equations; Linear evolution equations; *Theory for nonlinear partial differential equations:* The calculus of variations; Nonvariational techniques; Hamilton–Jacobi equations; Systems of conservation laws; Nonlinear wave equations; Appendices; Bibliography; Index.

Graduate Studies in Mathematics, Volume 19

April 2010, 749 pages, Hardcover, ISBN: 978-0-8218-4974-3, LC 2009044716, 2010 *Mathematics Subject Classification:* 35-XX; 49-XX, 47Hxx, **AMS members US\$74**, List US\$93, Order code GSM/19.R



Elliptic Equations in Polyhedral Domains

Vladimir Maz'ya, *Linköping University, Sweden*, and Jürgen Rossmann, *Rostock University, Germany*

This is the first monograph which systematically treats elliptic boundary value problems in domains of polyhedral type. The authors mainly describe their

own recent results focusing on the Dirichlet problem for linear strongly elliptic systems of arbitrary order, Neumann and mixed boundary value problems for second order systems, and on boundary value problems for the stationary Stokes and Navier–Stokes systems. A feature of the book is the systematic use of Green's matrices. Using estimates for the elements of these matrices, the authors obtain solvability and regularity theorems for the solutions in weighted and non-weighted Sobolev and Hölder spaces. Some classical problems of mathematical physics (Laplace and biharmonic equations, Lamé system) are considered as examples. Furthermore, the book contains maximum modulus estimates for the solutions and their derivatives.

The exposition is self-contained, and an introductory chapter provides background material on the theory of elliptic boundary value problems in domains with smooth boundaries and in domains with conical points.

The book is destined for graduate students and researchers working in elliptic partial differential equations and applications.

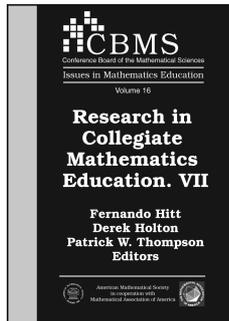
Contents: Introduction; *The Dirichlet problem for strongly elliptic systems in polyhedral domains:* Prerequisites on elliptic boundary value problems in domains with conical points; The Dirichlet problem for strongly elliptic systems in a dihedron; The Dirichlet problem for strongly elliptic systems in a cone with edges; The Dirichlet problem in a bounded domain of polyhedral type; The Miranda–Agmon maximum principle; *Neumann and mixed*

boundary value problems for second order systems in polyhedral domains: Boundary value problems for second order systems in a dihedron; Boundary value problems for second order systems in a polyhedral cone; Boundary value problems for second order systems in a bounded polyhedral domain; *Mixed boundary value problems for stationary Stokes and Navier-Stokes systems in polyhedral domains*: Boundary value problem for the Stokes system in a dihedron; Mixed boundary value problems for the Stokes system in a polyhedral cone; Mixed boundary value problems for the Stokes and Navier-Stokes systems in a bounded domain of polyhedral type; Historical remarks; Bibliography; Index; List of symbols.

Mathematical Surveys and Monographs, Volume 162

April 2010, 605 pages, Hardcover, ISBN: 978-0-8218-4983-5, LC 2009053203, 2000 *Mathematics Subject Classification*: 35J57, 35J58, 35J25, 35J40, 35J08, 35J05, 35Q30, **AMS members US\$98**, List US\$123, Order code SURV/162

General and Interdisciplinary



Research in Collegiate Mathematics Education. VII

Fernando Hitt, *Université du Québec à Montréal, QC, Canada*,
Derek Holton, *University of Melbourne, Parkville, Victoria, Australia*, and
Patrick W. Thompson, *Arizona State University, Tempe, AZ*, Editors

The present volume of *Research in Collegiate Mathematics Education*, like previous volumes in this series, reflects the importance of research in mathematics education at the collegiate level. The editors in this series encourage communication between mathematicians and mathematics educators, and as pointed out by the International Commission of Mathematics Instruction (ICMI), much more work is needed in concert with these two groups. Indeed, editors of RCME are aware of this need and the articles published in this series are in line with that goal.

Nine papers constitute this volume. The first two examine problems students experience when converting a representation from one particular system of representations to another. The next three papers investigate students learning about proofs. In the next two papers, the focus is instructor knowledge for teaching calculus. The final two papers in the volume address the nature of "conception" in mathematics.

Whether they are specialists in education or mathematicians interested in finding out about the field, readers will obtain new insights about teaching and learning and will take away ideas that they can use.

This series is published in cooperation with the Mathematical Association of America.

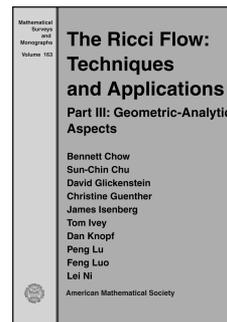
Contents: **R. Zazkis** and **N. Sirotic**, Representing and defining irrational numbers: Exposing the missing link; **M. C. Machín**, **R. D. Rivero**, and **M. Santos-Trigo**, Students' use of *Derive*

software in comprehending and making sense of definite integral and area concepts; **L. Alcock**, Mathematicians' perspectives on the teaching and learning of proof; **L. Alcock** and **K. Weber**, Referential and syntactic approaches to proving: Case studies from a transition-to-proof course; **A. Brown**, **M. A. McDonald**, and **K. Weller**, Step by step: Infinite iterative processes and actual infinity; **D. T. Kung**, Teaching assistants learning how students think; **K. S. Sofronas** and **T. C. DeFranco**, An examination of the knowledge base for teaching among mathematics faculty teaching calculus in higher education; **N. Balacheff** and **N. Gaudin**, Modeling students' conceptions: The case of function; **V. Mesa**, Strategies for controlling the work in mathematics textbooks for introductory calculus.

CBMS Issues in Mathematics Education, Volume 16

April 2010, 261 pages, Softcover, ISBN: 978-0-8218-4996-5, 2000 *Mathematics Subject Classification*: 97Axx, 97Cxx, 97Dxx, 97Fxx, 97Ixx, 97Uxx, 97-XX, 00-XX, **AMS members US\$47**, List US\$59, Order code CBMATH/16

Geometry and Topology



The Ricci Flow: Techniques and Applications

Part III: Geometric-Analytic Aspects

Bennett Chow, *University of California, San Diego, La Jolla, CA*, **Sun-Chin Chu**, *National Chung Cheng University, Chia-Yi, Taiwan*, **David Glickenstein**, *University of Arizona, Tucson, AZ*, **Christine Guenther**, *Pacific University, Forest Grove, OR*, **James Isenberg**, *University of Oregon, Eugene, OR*, **Tom Ivey**, *College of Charleston, SC*, **Dan Knopf**, *University of Texas, Austin, TX*, **Peng Lu**, *University of Oregon, Eugene, OR*, **Feng Luo**, *Rutgers University, Piscataway, NJ*, and **Lei Ni**, *University of California, San Diego, La Jolla, CA*

The Ricci flow uses methods from analysis to study the geometry and topology of manifolds. With the third part of their volume on techniques and applications of the theory, the authors give a presentation of Hamilton's Ricci flow for graduate students and mathematicians interested in working in the subject, with an emphasis on the geometric and analytic aspects.

The topics include Perelman's entropy functional, point picking methods, aspects of Perelman's theory of κ -solutions including the κ -gap theorem, compactness theorem and derivative estimates, Perelman's pseudolocality theorem, and aspects of the heat equation with respect to static and evolving metrics related to Ricci flow. In the appendices, we review metric and Riemannian geometry including the space of points at infinity and Sharafutdinov retraction for complete noncompact manifolds with nonnegative sectional curvature. As in the previous volumes, the authors have

endeavored, as much as possible, to make the chapters independent of each other.

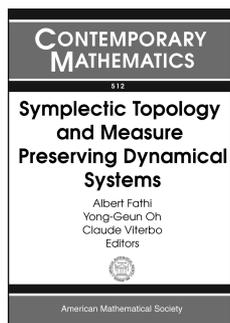
The book makes advanced material accessible to graduate students and nonexperts. It includes a rigorous introduction to some of Perelman's work and explains some technical aspects of Ricci flow useful for singularity analysis. The authors give the appropriate references so that the reader may further pursue the statements and proofs of the various results.

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

Contents: Entropy, μ -invariant, and finite time singularities; Geometric tools and point picking methods; Geometric properties of κ -solutions; Compactness of the space of κ -solutions; Perelman's pseudolocality theorem; Tools used in proof of pseudolocality; Heat kernel for static metrics; Heat kernel for evolving metrics; Estimates of the heat equation for evolving metrics; Bounds for the heat kernel for evolving metrics; Elementary aspects of metric geometry; Convex functions on Riemannian manifolds; Asymptotic cones and Sharafutdinov retraction; Solutions to selected exercises; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 163

June 2010, approximately 525 pages, Hardcover, ISBN: 978-0-8218-4661-2, LC 2007275659, 2010 *Mathematics Subject Classification*: 53C44, 53C25, 58J35, 35K55, 35K05, 35K08, 35K10, 53C21, **AMS members US\$90**, List US\$113, Order code SURV/163



Symplectic Topology and Measure Preserving Dynamical Systems

Albert Fathi, *École Normale Supérieure de Lyon, France*,
Yong-Geun Oh, *University of Wisconsin, Madison, WI*,
and **Claude Viterbo**, *École*

Polytechnique, Palaiseau, France, Editors

The papers in this volume were presented at the AMS-IMS-SIAM Joint Summer Research Conference on Symplectic Topology and Measure Preserving Dynamical Systems held in Snowbird, Utah in July 2007.

The aim of the conference was to bring together specialists of symplectic topology and of measure preserving dynamics to try to connect these two subjects. One of the motivating conjectures at the interface of these two fields is the question of whether the group of area preserving homeomorphisms of the 2-disc is or is not simple. For diffeomorphisms it was known that the kernel of the Calabi invariant is a normal proper subgroup, so the group of area preserving diffeomorphisms is not simple. Most articles are related to understanding these and related questions in the framework of modern symplectic topology.

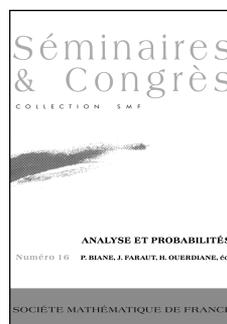
Contents: **A. Banyaga**, A Hofer-like metric on the group of symplectic diffeomorphisms; **M. Entov** and **L. Polterovich**, C^0 -rigidity of Poisson brackets; **F. Le Roux**, Six questions, a proposition and two pictures on Hofer distance for Hamiltonian diffeomorphisms on surfaces; **J. N. Mather**, Order structure on action minimizing orbits; **D. McDuff**, Loops in the Hamiltonian group: A survey; **Y.-G. Oh**, The group of Hamiltonian homeomorphisms and continuous Hamiltonian flows.

Contemporary Mathematics, Volume 512

May 2010, 177 pages, Softcover, ISBN: 978-0-8218-4892-0, LC 2009051896, 2000 *Mathematics Subject Classification*: 57R17, 37J05, 28D05, 37A15, **AMS members US\$55**, List US\$69, Order code CONM/512

New AMS-Distributed Publications

Analysis



Analyse et Probabilités

Philippe Biane, *École Normale Supérieure, Paris, France*,
Jacques Faraut, *Université Pierre et Marie Curie, Paris, France*, and
Habib Ouerdiane, *Université de Tunis, El Manar, Tunisia*, Editors

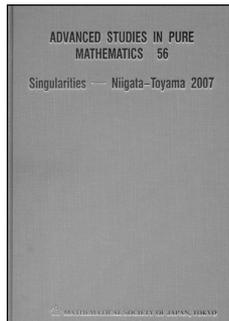
The International Congress on Analysis and Probability, held in Hammamet, Tunisia, in 2003, was organized under the aegis of the French Mathematical Society and the Tunisian Mathematical Society. The aim of this conference was to present recent developments in analysis, mainly in harmonic analysis and probability, stressing their interplay. The papers in this volume, originating from talks given at this conference, are related to stochastic analysis, harmonic analysis, and partial differential equations.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: **T. Deck**, Holomorphic functionals of complex processes; **U. C. Ji** and **N. Obata**, Generalized white noise operator fields and quantum white noise derivatives; **S. H. Djah**, **H. Gottschalk**, and **H. Ouerdiane**, Feynman graphs for non-Gaussian measures; **G. Di Nunno**, On orthogonal polynomials and the Malliavin derivative for Lévy stochastic measures; **G. Di Nunno** and **B. Øksendal**, The Donsker delta function, a representation formula for functionals of a Lévy process and application to hedging in incomplete markets; **U. Franz**, Boolean convolution of probability measures on the unit circle; **J. Faraut**, Loi du demi-cercle de Wigner et polynômes de Laguerre; **P. Krée**, Problèmes liés aux contrôles de taille legendriens. I. Premiers résultats généraux et premières interactions; **S. B. Saïd** and **B. Ørsted**, On contractions of hypergeometric functions associated with root systems; **S. B. Saïd** and **B. Ørsted**, On Fock spaces and $sl(2)$ -triples for Dunkl operators; **S. Mustapha**, Principe SAK de Fefferman et puissances d'opérateurs pseudo-différentiels; **N. Belhaj Rhouma**, **M. Bezzarga**, and **M. Mosbah**, On the solutions of noncooperative system of elliptic equations in \mathbb{R}^d .

Séminaires et Congrès, Number 16

July 2009, 232 pages, Softcover, ISBN: 978-2-85629-238-9, 2000 *Mathematics Subject Classification*: 33C45, 33C67, 46G20, 47G30, 60G07, 60H07, 60H40, **Individual member US\$63**, List US\$70, Order code SECO/16



Singularities— Niigata–Toyama 2007

Jean-Paul Brasselet, *CNRS, Marseille, France*, **Shihoko Ishii**, *Tokyo Institute of Technology, Japan*, **Tatsuo Suwa**, *Niigata University, Japan*, and **Michel Vaquie**, *Université de Toulouse, France*, Editors

This volume constitutes the proceedings of the Fourth Franco-Japanese Symposium on Singularities held at Toyama in August 2007 and also the Workshop on Singularities held at Niigata prior to this symposium. Research on singularities is widely expanding and is now applied in various areas in mathematics and other sciences. Experts in singularities from many different fields have contributed their articles, mostly on original results and some surveys. The reader will learn about the vividly developing domains and will be inspired by many different approaches to singularities.

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

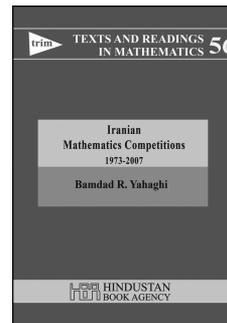
Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

Contents: **T. Ashikaga** and **K.-I. Yoshikawa**, A divisor on the moduli space of curves associated to the signature of fibered surfaces (with an appendix by Kazuhiro Konno); **K. Konno**, Appendix to “A divisor on the moduli space of curves associated to the signature of fibered surfaces” by T. Ashikaga and K.-I. Yoshikawa; **T. Asuke**, On the Fatou–Julia decomposition of transversally holomorphic foliations of complex codimension one; **J.-P. Brasselet**, Characteristic classes along the Japanese singularity road; **A. Degtyarev**, On irreducible sextics with non-abelian fundamental group; **A. Degtyarev** and **M. Oka**, A plane sextic with finite fundamental group; **C. Eyrat** and **M. Oka**, A proof of a conjecture of Degtyarev on non-torus plane sextics; **G. Gonzalez-Sprinberg**, On Nash blow-up of orbifolds; **K. Hasegawa**, Complex and Kähler structures on compact homogeneous manifolds—their existence, classification and moduli problem; **H. Ishida** and **H. Tokunaga**, Triple covers of algebraic surfaces and a generalization of Zariski’s example; **S. Ishii**, Smoothness and jet schemes; **M. Ishikawa**, On the contact structure of a class of real analytic germs of the form $f\bar{g}$; **M. Oka**, Topology of abelian pencils of curves; **O. Riemenschneider**, Simple analytic proofs of some versions of the abstract Prime Number Theorem; **I. Shimada**, Non-homeomorphic conjugate complex varieties; **M. Shubladze**, On the middle Betti number of certain singularities with critical locus a hyperplane; **T. Suwa**, Čech–Dolbeault cohomology and the δ -Thom class; **S. Tajima**, **Y. Nakamura**, and **K. Nabeshima**, Standard bases and algebraic local cohomology for zero dimensional ideals; **S. Yokura**, A universal bivariant theory and cobordism groups.

Advanced Studies in Pure Mathematics, Volume 56

November 2009, 408 pages, Hardcover, ISBN: 978-4-931469-55-6, 2000 *Mathematics Subject Classification*: 32Sxx; 14B05, 14B07, 14J17, **AMS members US\$58**, List US\$72, Order code ASPM/56

General and Interdisciplinary



Iranian Mathematics Competitions, 1973–2007

Bamdad R. Yahaghi, *University of Golestan, Iran*

This book presents a collection of problems from an annual competition for college students organized by the Iranian Mathematical Society. The author has compiled problems from these competitions between 1973 to 2007 and provided solutions to most of them.

Students from Iran have done very well in international mathematics competitions and, to some extent, that is a reflection on the training they receive in special courses. Students of mathematics everywhere, whether preparing for competitions or for advanced studies, can sharpen their skills by solving the problems in this book. The book will be a valuable resource for teachers as well.

A publication of Hindustan Book Agency. Distributed on an exclusive basis by the AMS in North America. Online bookstore rights worldwide.

Contents: Part 1. Problems; Part 2. Solutions; Part 3. Problem Index; Index.

Hindustan Book Agency

January 2010, 300 pages, Hardcover, ISBN: 978-81-85931-99-9, 2000 *Mathematics Subject Classification*: 00A07, 97U40, **AMS members US\$37**, List US\$46, Order code HIN/45