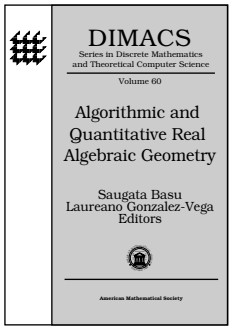
New Publications Offered by the AMS

Algebra and Algebraic Geometry



Algorithmic and Quantitative Real Algebraic Geometry

Saugata Basu, *Georgia Institute of Technology, Atlanta,* and **Laureano Gonzalez-Vega**, *University of Cantabria, Santander, Spain*, Editors

Algorithmic and quantitative aspects in real algebraic geometry are becoming increasingly important areas of research because of their roles in other areas of mathematics and computer science. The papers in this volume collectively span several different areas of current research.

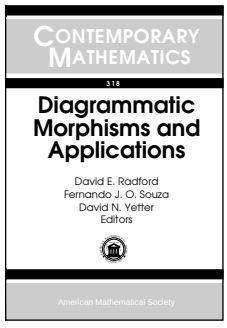
The articles are based on talks given at the DIMACS Workshop on "Algorithmic and Quantitative Aspects of Real Algebraic Geometry". Topics include deciding basic algebraic properties of real semi-algebraic sets, application of quantitative results in real algebraic geometry towards investigating the computational complexity of various problems, algorithmic and quantitative questions in real enumerative geometry, new approaches towards solving decision problems in semi-algebraic geometry, as well as computing algebraic certificates, and applications of real algebraic geometry to concrete problems arising in robotics and computer graphics. The book is intended for researchers interested in computational methods in algebra.

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

Contents: C. Andradas, Characterization and description of basic semialgebraic sets; **D. Bailey** and **V. Powers**, Constructive approaches to representation theorems in finitely generated real algebras; **I. Bonnard**, Combinatorial characterizations of algebraic sets; **P. Bürgisser**, Lower bounds and real algebraic geometry; **B. Chevallier**, The Viro method applied with quadratic transforms; **A. Gabrielov** and **T. Zell**, On the number of connected components of the relative closure of a semi-Pfaffian family; **C. McCrory**, How to show a set is not algebraic; **P. A. Parrilo** and **B. Sturmfels**, Minimizing polynomial functions; **B. Reznick**, Patterns of dependence among powers of polynomials; **F. Rouillier**, Efficient algorithms based on critical points method; **F. Sottile**, Enumerative real algebraic geometry; **I. Streinu**, Combinatorial roadmaps in configuration spaces of simple planar polygons; **T. Theobald**, Visibility computations: From discrete algorithms to real algebraic geometry.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 60

April 2003, approximately 232 pages, Hardcover, ISBN 0-8218-2863-0, LC 2002038522, 2000 *Mathematics Subject Classification*: 14P05, 14P10, 14P15, 14P20, 14P25, 14P99, 14Q20, 68W30, **All AMS members $55**, List $69, Order code DIMACS/60N



Diagrammatic Morphisms and Applications

David E. Radford, *University of Illinois at Chicago,* **Fernando J. O. Souza**, *University of Iowa, Iowa City,* and **David N. Yetter**, *Kansas State University, Manhattan,* Editors

The technique of diagrammatic morphisms is an important ingredient in comprehending and visualizing certain types of categories with structure. It was widely used in this capacity in many areas of algebra, low-dimensional topology and physics. It was also applied to problems in classical and quantum information processing and logic.

This volume contains articles based on talks at the Special Session, "Diagrammatic Morphisms in Algebra, Category Theory, and Topology", at the AMS Sectional Meeting in San Francisco. The articles describe recent achievements in several aspects of diagrammatic morphisms and their applications. Some of them contain detailed expositions on various diagrammatic techniques. The introductory article by D. Yetter is a thorough account of the subject in a historical perspective.

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

Contents: D. N. Yetter, Diagrammatic morphisms; **J. C. Baez**, Spin foam perturbation theory; **J. W. Barrett**, Unlinked

embedded graphs; **Y. Bespalov** and **B. Drabant**, Report on cross product bialgebras in braided categories; **J. S. Carter**, **S. Kamada**, and **M. Saito**, Diagrammatic computations for quandles and cocycle knot invariants; **B. Day** and **R. Street**, Lax monoids, pseudo-operads, and convolution; **M. Đurđevich**, Diagrammatic formulation of multi-braided quantum groups; **C. Frohman** and **J. Kania-Bartoszynska**, A matrix model for quantum SL_2; **L. H. Kauffman** and **D. Radford**, Bi-oriented quantum algebras, and a generalized Alexander polynomial for virtual links; **T. Kerler**, Towards an algebraic characterization of 3-dimensional cobordisms; **Z. Oziewicz**, Operad of graphs, convolution and quasi Hopf algebra; **J. H. Przytycki** and **A. S. Sikora**, SU_n-quantum invariants for periodic links; **R. Street**, Weak omega-categories.

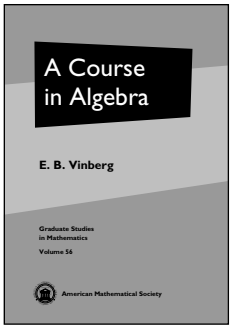
Contemporary Mathematics, Volume 318

April 2003, 218 pages, Softcover, ISBN 0-8218-2794-4, LC 2002033012, 2000 *Mathematics Subject Classification*: 00B25, 16W30, 18Dxx, 57M15, 57M25, 57M27, 83C45; 15–XX, 16B50, 16S30, **All AMS members $47**, List $59, Order code CONM/318N

Available in Hardcover and Softcover Editions

Recommended Text

Independent Study



A Course in Algebra

E. B. Vinberg, *Moscow State University*

Great book! The author's teaching experience shows in every chapter.

—E. Zelmanov, University of California, San Diego

Vinberg has written an algebra book that is excellent, both as a classroom text or for self-study. It starts with the most basic concepts and builds in orderly fashion to moderately advanced topics … Well motivated examples help the student … to master the material thoroughly, and exercises test one's growing skill in addition to covering useful auxiliary facts … years of teaching abstract algebra have enabled Vinberg to say the right thing at the right time.

—Irving Kaplansky, MSRI

This is a comprehensive textbook on modern algebra written by an internationally renowned specialist. It covers material traditionally found in advanced undergraduate and basic graduate courses and presents it in a lucid style. The author includes almost no technically difficult proofs, and reflecting his point of view on mathematics, he tries wherever possible to replace calculations and difficult deductions with conceptual proofs and to associate geometric images to algebraic objects. The effort spent on the part of students in absorbing these ideas will pay off when they turn to solving problems outside of this textbook.

Another important feature is the presentation of most topics on several levels, allowing students to move smoothly from initial acquaintance with the subject to thorough study and a deeper understanding. Basic topics are included, such as algebraic structures, linear algebra, polynomials, and groups, as well as more advanced topics, such as affine and projective spaces, tensor algebra, Galois theory, Lie groups, and associative algebras and their representations. Some applications of linear algebra and group theory to physics are discussed.

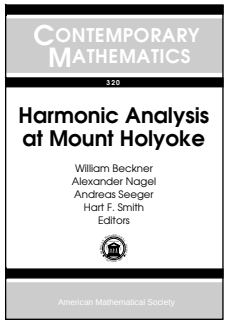
The book is written with extreme care and contains over 200 exercises and 70 figures. It is an ideal textbook or suitable for independent study for advanced undergraduates and graduate students.

Contents: Algebraic structures; Elements of linear algebra; Elements of polynomial algebra; Elements of group theory; Vector spaces; Linear operators; Affine and projective spaces; Tensor algebra; Commutative algebra; Groups; Linear representations and associative algebras; Lie groups; Answers to selected exercises; Bibliography; Index.

Graduate Studies in Mathematics, Volume 56

May 2003, approximately 528 pages; LC 2002033011, 2000 *Mathematics Subject Classification*: 13–01, 15–01, 16–01, 20–01,
Hardcover: ISBN 0-8218-3318-9, **All AMS members $71**, List $89, Order code GSM/56N
Softcover: ISBN 0-8218-3413-4, **All AMS members $47**, List $59, Order code GSM/56.SN

Analysis



Harmonic Analysis at Mount Holyoke

William Beckner, *University of Texas, Austin,* **Alexander Nagel** and **Andreas Seeger**, *University of Wisconsin, Madison,* and **Hart F. Smith**, *University of Washington, Seattle,* Editors

This volume contains the proceedings of the conference on harmonic analysis and related areas. The conference provided an opportunity for researchers and students to exchange ideas and report on progress in this large and central field of modern mathematics.

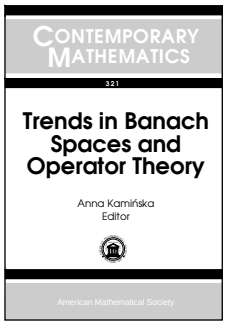
The volume is suitable for graduate students and research mathematicians interested in harmonic analysis and related areas.

Contents: A. Alfonseca, **F. Soria**, and **A. Vargas**, An almost-orthogonality principle in L^2 for directional maximal functions; **J.-G. Bak** and **D. M. Oberlin**, A note on Fourier restriction for curves in $\mathbb{R}^3$; **Z. M. Balogh** and **J. T. Tyson**, Potential theory in Carnot groups; **M. Bownik**, Quasi-affine systems and the Calderón condition; **L. Capogna** and **Q. Han**, Pointwise Schauder estimates for second order linear equations in Carnot groups; **A. Carbery**, A remark on an inequality of Katz and Tao; **M. Christ**, Slow off-diagonal decay for Szegö kernels associated to smooth Hermitian line bundles; **A. Comech**, Type conditions and L^p-L^p, L^p-$L^{p'}$ regularity of Fourier integral operators; **M. Cowling** and **H. M. Reimann**, Quasiconformal mappings on Carnot groups: Three examples; **G. David**, Limits of Almgren quasiminimal sets; **G. Furioli**, **F. Planchon**, and **E. Terraneo**, Unconditional well-posedness for semilinear Schrödinger and wave equations in $\mathbf{H^s}$; **G. Gigante** and **F. Soria**, A note on oscillatory integrals and

Bessel functions; **L. Grafakos** and **X. Li**, The bilinear multiplier problem for the disc; **P. A. Hagelstein**, Long thoughts on a conjecture of Fava, Gatto, and Gutiérrez; **A. Iosevich** and **E. Sawyer**, Three problems motivated by the average decay of the Fourier transform; **N. H. Katz**, A partial result on Lipschitz differentiation; **A. Koldobsky**, Sections of star bodies and the Fourier transform; **O. Kovrizhkin**, The uncertainty principle for relatively dense sets and lacunary spectra; **J. Mateu**, **X. Tolsa**, and **J. Verdera**, On the semiadditivity of analytic capacity and planar Cantor sets; **A. L. Mazzucato**, Decomposition of Besov-Morrey spaces; **A. R. Nahmod**, On Schrödinger and wave maps; **C. Pérez** and **R. H. Torres**, Sharp maximal function estimates for multilinear singular integrals; **M. A. Pinsky**, Fejér asymptotics and the Hilbert transform; **A. Seeger**, **T. Tao**, and **J. Wright**, Pointwise convergence of lacunary spherical means; **C. D. Sogge**, Global existence for nonlinear wave equations with multiple speeds; **G. Staffilani**, KdV and almost conservation laws; **D. Tataru**, Null form estimates for second order hyperbolic operators with rough coefficients; **M. E. Taylor**, Multi-dimensional Fejér kernel asymptotics; **J. A. Toth** and **S. Zelditch**, Norms of modes and quasi-modes revisited; **W. Trebels** and **U. Westphal**, K-functionals on $L^1(\mathbb{R}^n)$ related to the Laplacian.

Contemporary Mathematics, Volume 320

May 2003, approximately 488 pages, Softcover, ISBN 0-8218-2903-3, 2000 *Mathematics Subject Classification*: 42B15, 42B20, 42B25, 42B35, 42C40, 32W05, 35L10, 35S30, 35H20, 35P20, **All AMS members $87**, List $109, Order code CONM/320N



Trends in Banach Spaces and Operator Theory

Anna Kamińska, *University of Memphis*, Editor

This volume contains proceedings of the conference on Trends in Banach Spaces and Operator Theory, which was devoted to recent advances in theories of Banach spaces and linear operators.

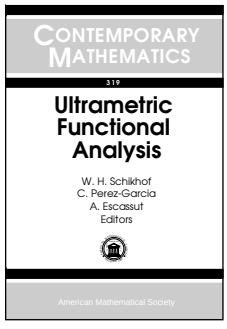
Included in the volume are 25 papers, some of which are expository, while others present new results. The articles address the following topics: history of the famous James' theorem on reflexivity, projective tensor products, construction of noncommutative L_p-spaces via interpolation, Banach spaces with abundance of nontrivial operators, Banach spaces with small spaces of operators, convex geometry of Coxeter-invariant polyhedra, uniqueness of unconditional bases in quasi-Banach spaces, dynamics of cohyponormal operators, and Fourier algebras for locally compact groupoids.

The book is suitable for graduate students and research mathematicians interested in Banach spaces and operator theory and their applications.

Contents: M. D. Acosta, **J. B. Guerrero**, and **M. R. Galán**, Characterizations of the reflexive spaces in the spirit of James' Theorem; **F. Albiac**, **N. J. Kalton**, and **C. Leránoz**, Uniqueness of unconditional bases in quasi-Banach spaces; **G. Androulakis**, A note on the method of minimal vectors; **J. Diestel**, **J. Fourie**, and **J. Swart**, The projective tensor product I; **S. J. Dilworth** and **V. G. Troitsky**, Spectrum of a weakly hypercyclic operator meets the unit circle; **N. S. Feldman**, The dynamics of cohyponormal operators; **E. A. Gallardo-Gutiérrez** and **M. J. González**, Hilbert-Schmidt composition operators on Dirichlet spaces; **N. J. Kalton**, A remark on sectorial operators with an $H^\infty-$ calculus; **J. Kawabe**, Borel injective tensor product and convolution of vector measures and their weak convergence; **V. A. Khatskevich** and **V. S. Shulman**, On linear operator pencils and inclusions of images of balls; **D. H. Leung** and **W.-K. Tang**, Ordinal indices and ℓ^1-spreading models; **J. López-Gómez** and **C. Mora-Corral**, Characterizing the existence of local Smith forms for C^∞ families of matrix operators; **N. McCarthy**, **D. Ogilvie**, **N. Zobin**, and **V. Zobin**, Convex geometry of Coxeter-invariant polyhedra; **J. Miao**, Commutators on bounded symmetric domains in $\mathbb{C}^n$; **T. L. Miller**, **V. G. Miller**, and **M. M. Neumann**, Growth conditions and decomposable extensions; **J. Moorhouse** and **C. Toews**, Differences of composition operators; **G. A. Muñoz**, Complex vs real variables for real 3-homogeneous polynomials on ℓ_1^2: A counterexample; **A. L. T. Paterson**, The Fourier-Stieltjes and Fourier algebras for locally compact groupoids; **G. T. Prăjitură**, Preserving the commutant under functional calculus; **Y. Raynaud**, L_p-spaces associated with a von Neumann algebra without trace: a gentle introduction via complex interpolation; **H. P. Rosenthal**, Banach and operator space structure of C^*-algebras; **T. Schlumprecht**, How many operators exist on a Banach space?; **G. V. Wood**, Maximal algebra norms; **A. Zsák**, On Banach spaces with small spaces of operators; **A. Zvavitch**, A remark on p-summing norms of operators.

Contemporary Mathematics, Volume 321

May 2003, 366 pages, Softcover, ISBN 0-8218-3234-4, LC 2003041485, 2000 *Mathematics Subject Classification*: 22A22, 46Axx, 46Bxx, 46E30, 46Lxx, 47Axx, 47Bxx, 47Hxx, 47Lxx, 51F15, **All AMS members $71**, List $89, Order code CONM/321N



Ultrametric Functional Analysis

W. H. Schikhof, *University of Nijmegen, The Netherlands*, **C. Perez-Garcia**, *Universidad de Cantabria, Santander, Spain*, and **A. Escassut**, *Université Blaise Pascal, Aubiére, France*, Editors

This volume contains research articles based on lectures given at the Seventh International Conference on p-adic Functional Analysis.

The articles, written by leading international experts, provide a complete overview of the latest contributions in basic functional analysis (Hilbert and Banach spaces, locally convex spaces, orthogonality, inductive limits, spaces of continuous functions, strict topologies, operator theory, automatic continuity, measure and integrations, Banach and topological algebras, summability methods, and ultrametric spaces), analytic functions (meromorphic functions, roots of rational functions, characterization of injective holomorphic functions, and Gelfand transforms in algebras of analytic functions), differential equations, Banach-Hopf algebras, Cauchy theory of Levi-Civita fields, finite differences, weighted means, p-adic

dynamical systems, and non-Archimedean probability theory and stochastic processes.

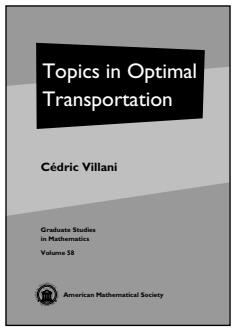
The book is written for graduate students and research mathematicians. It also would make a good reference source for those in related areas, such as classical functional analysis, complex analytic functions, probability theory, dynamical systems, orthomodular spaces, number theory, and representations of p-adic groups.

Contents: J. Aguayo and **M. Nova**, Non-archimedean integral operators on the space of continuous functions; **J. Araujo**, Isomorphisms with small bound between spaces of p-adic continuous functions; **E. Beckenstein** and **L. Narici**, Automatic continuity of basis separating maps; **M. Berz**, Cauchy theory on Levi-Civita fields; **A. Boutabaa** and **A. Escassut**, Uniqueness problems and applications of the ultrametric Nevanlinna theory; **B. Diarra**, The Hopf algebra structure of the space of continuous functions on power series over $\mathbb{F}_q$ and Carlitz polynomials; **N. De Grande-de Kimpe**, **J. Kąkol**, and **C. Perez-Garcia**, Metrizability of compactoid sets in non-archimedean Hausdorff (LM)-spaces; **A. K. Katsaras**, Strict topologies and vector-measures on non-archimedean spaces; **A. K. Katsaras** and **C. G. Petalas**, P-adic spaces with strict topologies as topological algebras; **A. Khrennikov** and **S. Ludkovsky**, Non-archimedean stochastic processes; **A. Khrennikov**, **M. Nilsson**, and **R. Nyqvist**, The asymptotic number of periodic points of discrete polynomial p-adic dynamical systems; **A. N. Kochubei**, Analysis and probability over infinite extensions of a local field, II: A multiplicative theory; **A. Kubzdela**, The Hahn-Banach subspaces of Banach spaces with base; **A. J. Lemin** and **V. Lemin**, On metrically universal ultrametric spaces LV_τ and LW_τ; **N. Maïnetti**, Gelfand transform and spectral radius formulae for ultrametric Banach algebras; **P. N. Natarajan**, A theorem on summability factors for regular methods in complete ultrametric fields; **H. Ochsenius**, Hilbert-like spaces over Krull valued fields; **H. Ochsenius** and **W. H. Schikhof**, Compact operators on non-classical Hilbert spaces; **C. Perez-Garcia**, Locally convex spaces over non-archimedean valued fields; **C. Perez-Garcia** and **W. H. Schikhof**, Finite-dimensional orthocomplemented subspaces in p-adic normed spaces; **S. Priess-Crampe** and **P. Ribenboim**, Systems of differential equations over valued fields; **J. Rivera-Letelier**, Bi-analytic elements and partial isometries of hyperbolic space; **M.-C. Sarmant**, Analytic roots of solutions of p-adic differential equations; **K. Shamseddine** and **M. Berz**, Measure theory and integration on the Levi-Civita field; **W. Śliwa**, On block basic sequences in non-archimedean Fréchet spaces; **P.-A. Svensson**, Dynamical systems in unramified or totally ramified extensions of the p-adic number field; **L. van Hamme**, p-adic analysis and the calculus of finite differences.

Contemporary Mathematics, Volume 319

May 2003, approximately 432 pages, Softcover, ISBN 0-8218-3320-0, LC 2003040327, 2000 *Mathematics Subject Classification*: 11S80, 12J25, 16W30, 30G35, 37A45, 46H40, 46S10, 47S10, 54E35, 60B99, **All AMS members $79**, List $99, Order code CONM/319N

Independent Study



Topics in Optimal Transportation

Cédric Villani, *Ecole Normale Supérieure de Lyon, France*

Cedric Villani's book is a lucid and very readable documentation of the tremendous recent analytic progress in "optimal mass transportation" theory and of its diverse and unexpected applications in optimization, nonlinear PDE, geometry, and mathematical physics.

—Lawrence C. Evans, University of California at Berkeley

This is the first comprehensive introduction to the theory of mass transportation with its many—and sometimes unexpected—applications. In a novel approach to the subject, the book both surveys the topic and includes a chapter of problems, making it a particularly useful graduate textbook.

In 1781, Gaspard Monge defined the problem of "optimal transportation" (or the transferring of mass with the least possible amount of work), with applications to engineering in mind. In 1942, Leonid Kantorovich applied the newborn machinery of linear programming to Monge's problem, with applications to economics in mind. In 1987, Yann Brenier used optimal transportation to prove a new projection theorem on the set of measure preserving maps, with applications to fluid mechanics in mind.

Each of these contributions marked the beginning of a whole mathematical theory, with many unexpected ramifications. Nowadays, the Monge-Kantorovich problem is used and studied by researchers from extremely diverse horizons, including probability theory, functional analysis, isoperimetry, partial differential equations, and even meteorology.

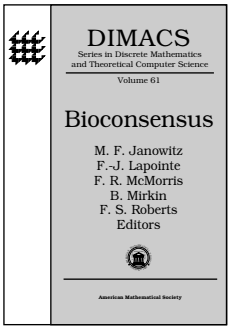
Originating from a graduate course, the present volume is intended for graduate students and researchers, covering both theory and applications. Readers are only assumed to be familiar with the basics of measure theory and functional analysis.

Contents: Introduction; The Kantorovich duality; Geometry of optimal transportation; Brenier's polar factorization theorem; The Monge-Ampère equation; Displacement interpolation and displacement convexity; Geometric and Gaussian inequalities; The metric side of optimal transportation; A differential point of view on optimal transportation; Entropy production and transportation inequalities; Problems; Bibliography; Table of short statements; Index.

Graduate Studies in Mathematics, Volume 58

May 2003, approximately 392 pages, Hardcover, ISBN 0-8218-3312-X, LC 2003040350, 2000 *Mathematics Subject Classification*: 49-XX; 35-XX, 60-XX, **All AMS members $47**, List $59, Order code GSM/58N

Applications



Bioconsensus

M. F. Janowitz, *Rutgers University, Piscataway, NJ*, **F.-J. Lapointe**, *University of Montreal, PQ, Canada*, **F. R. McMorris**, *Illinois Institute of Technology, Chicago,* **B. Mirkin**, *Birkbeck College, London,* and **F. S. Roberts**, *Rutgers University, Piscataway, NJ*, Editors

Consensus methods developed in the context of voting, decision making, and other areas of the social and behavioral sciences have a variety of applications in the biological sciences, originally in taxonomy and evolutionary biology, and more recently in molecular biology. Typically, several alternatives (such as alternative phylogenetic trees, molecular sequences, or alignments) are produced using different methods or under different models, and then one needs to find a consensus solution.

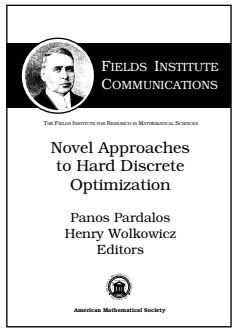
This volume is based on two DIMACS working group meetings on "Bioconsensus". It provides a valuable introduction and reference to the various aspects of this rapidly developing field. The meetings brought together mathematical and biological scientists to discuss the uses in the biological sciences of methods of consensus and social choice. These two lively meetings contributed much toward establishing the new field of "bioconsensus".

Yet this book is much more than just a report of two meetings. It includes some historical background, as well as a substantial introduction to the axiomatic foundations of the field of bioconsensus and some practical applications of consensus methods to real data. Also included are contributed papers from experts who were not at the meetings. The book is intended for mathematical biologists, evolutionary biologists, and computer scientists.

Contents: *Axiomatic considerations:* **W. H. E. Day** and **F. R. McMorris**, Axiomatics in group choice and bioconsensus; **F. R. McMorris** and **R. C. Powers**, The Arrovian program from weak orders to hierarchical and tree-like relations; **R. C. Powers**, Consensus n-trees, weak independence, and veto power; **D. Bryant**, **A. McKenzie**, and **M. Steel**, The size of a maximum agreement subtree for random binary trees; **G. D. Crown** and **M. F. Janowitz**, An injective set representation of closed systems of sets; *Data analysis considerations:* **N. V. R. Mahadev** and **F. S. Roberts**, Consensus list colorings of graphs and physical mapping of DNA; **B. Mirkin** and **E. Koonin**, A top-down method for building genome classification trees with linear binary hierarchies; **M. L. Gargano**, **W. Edelson**, and **J. DeCicco**, An application of seriation to agent development consensus: A genetic algorithm approach; **D. J. Cork**, Achieving consensus of long genomic sequences with the W-curve; **D. Chen**, **L. Diao**, **O. Eulenstein**, **D. Fernández-Baca**, and **M. Sanderson**, Flipping: A supertree construction method; *Practical considerations:* **D. Bryant**, A classification of consensus methods for phylogenetics; **J. L. Thorley** and **M. Wilkinson**, A view of supertree methods; **M. Wilkinson** and **J. L. Thorley**, Reduced consensus; **F.-J. Lapointe** and **G. Cucumel**, How good can a consensus get? Assessing the reliability of consensus trees in phylogenetic studies; **C. Levasseur** and **F.-J. Lapointe**, Increasing phylogenetic accuracy with global congruence; **O. R. P. Bininda-Emonds**, MRP supertree construction in the consensus setting.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 61

May 2003, approximately 256 pages, Hardcover, ISBN 0-8218-3197-6, 2000 *Mathematics Subject Classification*: 05C05, 05C65, 06A99, 62H30, 91B10, 91F99, 92B05, 92B10, 92C40, 92D15, **All AMS members $60**, List $75, Order code DIMACS/61N



Novel Approaches to Hard Discrete Optimization

Panos Pardalos, *University of Florida, Gainesville,* and **Henry Wolkowicz**, *University of Waterloo, ON, Canada*, Editors

During the last decade, many novel approaches have been considered for dealing with computationally difficult discrete optimization problems. Such approaches include interior point methods, semidefinite programming techniques, and global optimization. More efficient computational algorithms have been developed and larger problem instances of hard discrete problems have been solved. This progress is due in part to these novel approaches, but also to new computing facilities and massive parallelism.

This volume contains the papers presented at the workshop on "Novel Approaches to Hard Discrete Optimization". The articles cover a spectrum of issues regarding computationally hard discrete problems.

Contents: **A. Barvinok** and **T. Stephen**, On the distribution of values in the quadratic assignment problem; **V. Boginski**, **S. Butenko**, and **P. M. Pardalos**, Modeling and optimization in massive graphs; **M. Cardei**, **X. Cheng**, **X. Cheng**, and **D.-Z. Du**, A tale on guillotine cut; **M. X. Cheng**, **Z. Gong**, **X. Huang**, **H. Zhao**, **X. Jia**, and **D. Li**, Wavelength assignment algorithms in multifiber networks; **D. Coppersmith** and **J. Lee**, Indivisibility and divisbility polytopes; **W. W. Hager**, The dual active set algorithm and the iterative solution of linear programs; **C. J. Hillar** and **C. R. Johnson**, Positive eigenvalues of generalized words in two Hermitian positive definite matrices; **K. Krishnan** and **J. E. Mitchell**, Semi-infinite linear programming approaches to semidefinite programming problems; **J. B. Lasserre**, SDP versus LP relaxations for polynomial programming; **M. Min**, **S. C.-H. Huang**, **J. Liu**, **E. Shragowitz**, **W. Wu**, **Y. Zhao**, and **Y. Zhao**, An approximation scheme for the rectilinear Steiner minimum tree in presence of obstructions; **F. S. Mokhtarian**, A convex feasibility problem defined by a nonlinear separation oracle; **G. Zhou**, **J. Sun**, and **K.-C. Toh**, Efficient algorithms for the smallest enclosing ball problem in high dimensional space.

Fields Institute Communications, Volume 37

May 2003, 181 pages, Hardcover, ISBN 0-8218-3248-4, LC 2003040390, 2000 *Mathematics Subject Classification*: 90C06, 90C22, 90C51, 90C27, 90C10, 90C90, 90C26, 90B80, 90C09, 90C25, **All AMS members $50**, List $62, Order code FIC/37N

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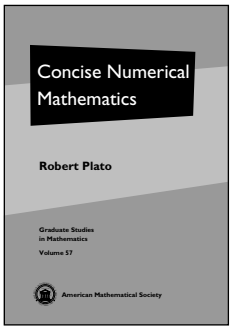
Recommended Text



Concise Numerical Mathematics

Robert Plato, *Technical University of Berlin*

From a review of the German edition:

Appealing result of [the author's] endeavours … The presentation is concise … avoiding unnecessary redundancies, but nevertheless is self-contained … even instructors are offered new views and insights … the author offers many well-chosen exercises … The book really is a valuable contribution to the literature on its subject.

—Zentralblatt MATH

This book succinctly covers many topics of numerical methods. While it is basically a survey of the subject, it has enough depth for the student to walk away with the ability to implement the methods by writing computer programs or applying them to problems in physics or engineering.

The author manages to cover the many important topics while avoiding redundancies and using well-chosen examples and exercises. The exposition is supplemented by numerous figures. Work estimates and pseudo codes are provided for many algorithms, which can be easily converted to computer programs. Topics covered include interpolation, the fast Fourier transform, iterative methods for solving systems of linear and nonlinear equations, numerical methods for solving ODEs, numerical methods for matrix eigenvalue problems, approximation theory, and computer arithmetic.

In general, the author assumes only a knowledge of calculus and linear algebra. The book is suitable as a text for a first course in numerical methods for mathematics students or students in neighboring fields, such as engineering, physics, and computer science.

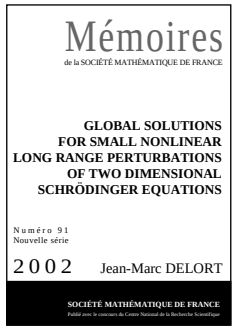
This item will also be of interest to those working in analysis.

Contents: Interpolation by polynomials; Spline functions; The discrete Fourier transform and its applications; Solution of linear systems of equations; Nonlinear systems of equations; The numerical integration of functions; Explicit one-step methods for initial value problems in ordinary differential equations; Multistep methods for initial value problems of ordinary differential equations; Boundary value problems for ordinary differential equations; Jacobi, Gauss-Seidel and relaxation methods for the solution of linear systems of equations; The conjugate gradient and GMRES methods; Eigenvalue problems; Numerical methods for eigenvalue problems; Peano's error representation; Approximation theory; Computer arithmetic; Bibliography; Index.

Graduate Studies in Mathematics, Volume 57

May 2003, approximately 472 pages, LC 2002033010, 2000 *Mathematics Subject Classification*: 65–00, 65–01, 65B05, 65B15, 65D05, 65D07, 65D10, 65D25, 65D30, 65D32, 65Fxx, 65G50, 65H05, 65H10, 65H17, 65K10, 65L05, 65L06, 65L10, 65L12, 65L20, 65L50, 65L60, 65L70, 65Q05, 65T40, 65T50, 65Y20, 49M15, 49M20,
Hardcover: ISBN 0-8218-2953-X, **All AMS members $68**, List $85, Order code GSM/57N
Softcover: ISBN 0-8218-3414-2, **All AMS members $44**, List $55, Order code GSM/57.SN

Differential Equations



Global Solutions for Small Nonlinear Long Range Perturbations of Two Dimensional Schrödinger Equations

Jean-Marc Delort, *University of Paris-Nord, Villetaneuse*

Here the author presents the following: Let Q_1, Q_2 be two quadratic forms, and u a local solution of the two-dimensional Schrödinger equation $(i\partial_t + \Delta)u = Q_1(u, \nabla_x u) + Q_2(\bar{u}, \nabla_x \bar{u})$. He proves that if Q_1 and Q_2 do depend on the derivatives of u, and if the Cauchy datum is small enough and decaying enough at infinity, the solution exists for all times. The difficulty of the problem originates in the fact that the nonlinear perturbation is a long range one: This means that it can be written as the product of (a derivative of) u and of a potential whose L^∞ space-norm is not time integrable at infinity.

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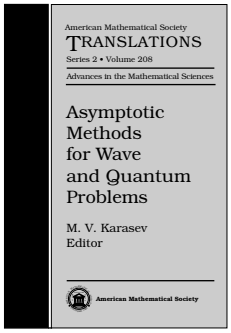
Contents: Introduction; The nonlinear Schrödinger equation; Linear estimates; Nonlinear estimates; Proof of the main theorem; Bibliography.

Mémoires de la Société Mathématique de France, Number 91

December 2002, 94 pages, Softcover, ISBN 2-85629-125-2, 2000 *Mathematics Subject Classification*: 35Q55; 35S50,
Individual member $59, List $66, Order code SMFMEM/91N

Mathematical Physics



Asymptotic Methods for Wave and Quantum Problems

M. V. Karasev, *Moscow Institute of Electronics and Mathematics*, Editor

The collection consists of four papers in different areas of mathematical physics united by the intrinsic coherence of the asymptotic methods used. The papers describe both the known results and most recent achievements, as well as new concepts and ideas in mathematical analysis of quantum and wave problems.

In the introductory paper "Quantization and Intrinsic Dynamics" a relationship between quantization of symplectic manifolds and nonlinear wave equations is described and discussed from the viewpoint of the weak asymptotics method (asymptotics in distributions) and the semiclassical approximation method. It also explains a hidden dynamic geometry that arises when using these methods.

Three other papers discuss applications of asymptotic methods to the construction of wave-type solutions of nonlinear PDE's, to the theory of semiclassical approximation (in particular, the Whitham method) for nonlinear second-order ordinary differential equations, and to the study of the Schrödinger type equations whose potential wells are sufficiently shallow that the discrete spectrum contains precisely one point.

All the papers contain detailed references and are oriented not only to specialists in asymptotic methods, but also to a wider audience of researchers and graduate students working in partial differential equations and mathematical physics.

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

Contents: M. Karasev, Quantization and intrinsic dynamics; **V. G. Danilov**, **G. A. Omel'yanov**, and **V. M. Shelkovich**, Weak asymptotics method and interaction of nonlinear waves; **M. V. Karasev** and **A. V. Pereskokov**, Global asymptotics and quantization rules for nonlinear differential equations; **P. Zhevandrov** and **A. Merzon**, Asymptotics of eigenfunctions in shallow potential wells and related problems.

American Mathematical Society Translations—Series 2 (*Advances in the Mathematical Sciences*), Volume 208

March 2003, 284 pages, Hardcover, ISBN 0-8218-3336-7, LC 91-640741, 2000 *Mathematics Subject Classification*: 34E20, 35Lxx, 81Qxx, **All AMS members $98**, List $123, Order code TRANS2/208N

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