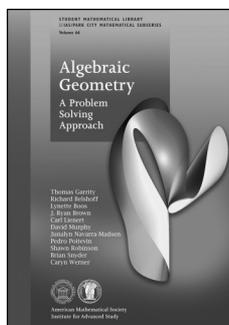


New Publications Offered by the AMS

To subscribe to email notification of new AMS publications, please go to <http://www.ams.org/bookstore-email>.

Algebra and Algebraic Geometry



Algebraic Geometry

A Problem Solving Approach

Thomas Garrity, *Williams College, Williamstown, MA*, **Richard Belshoff**, *Missouri State University, Springfield, MO*, **Lynette Boos**, *Providence College, RI*, **J. Ryan Brown**, *Georgia College and State University, Milledgeville, GA*, **Carl Lienert**, *Fort Lewis College, Durango, CO*, **David Murphy**, *Hillsdale College, MI*, **Junalyn Navarra-Madsen**, *Texas Woman's University, Denton, TX*, **Pedro Poitevin**, *Salem State University, MA*, **Shawn Robinson**, *Colorado Mesa University, Grand Junction, CO*, **Brian Snyder**, *Lake Superior State University, Sault Ste. Marie, MI*, and **Caryn Werner**, *Allegheny College, Meadville, PA*

Algebraic Geometry has been at the center of much of mathematics for hundreds of years. It is not an easy field to break into, despite its humble beginnings in the study of circles, ellipses, hyperbolas, and parabolas.

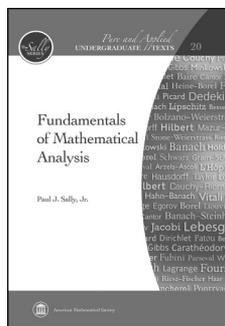
This text consists of a series of exercises, plus some background information and explanations, starting with conics and ending with sheaves and cohomology. The first chapter on conics is appropriate for first-year college students (and many high school students). Chapter 2 leads the reader to an understanding of the basics of cubic curves, while Chapter 3 introduces higher degree curves. Both chapters are appropriate for people who have taken multivariable calculus and linear algebra. Chapters 4 and 5 introduce geometric objects of higher dimension than curves. Abstract algebra now plays a critical role, making a first course in abstract algebra necessary from this point on. The last chapter is on sheaves and cohomology, providing a hint of current work in algebraic geometry.

Contents: Conics; Cubic curves and elliptic curves; Higher degree curves; Affine varieties; Projective varieties; The next steps: Sheaves and cohomology; Bibliography; Index.

Student Mathematical Library, Volume 66

February 2013, approximately 353 pages, Softcover, ISBN: 978-0-8218-9396-8, LC 2012037402, 2010 *Mathematics Subject Classification:* 14-01, **AMS members US\$42.40**, List US\$53, Order code STML/66

Analysis



Fundamentals of Mathematical Analysis

Paul J. Sally, Jr., *University of Chicago, IL*

This is a textbook for a course in Honors Analysis (for freshman/sophomore undergraduates) or Real Analysis (for junior/senior undergraduates) or Analysis-I (beginning graduates). It is intended for students who completed a course in "AP

Calculus", possibly followed by a routine course in multivariable calculus and a computational course in linear algebra.

There are three features that distinguish this book from many other books of a similar nature and which are important for the use of this book as a text. The first, and most important, feature is the collection of exercises. These are spread throughout the chapters and should be regarded as an essential component of the student's learning. Some of these exercises comprise a routine follow-up to the material, while others challenge the student's understanding more deeply. The second feature is the set of independent projects presented at the end of each chapter. These projects supplement the content studied in their respective chapters. They can be used to expand the student's knowledge and understanding or as an opportunity to conduct a seminar in Inquiry Based Learning in which the students present the material to their class. The third really important feature is a series of challenge problems that increase in impossibility as the chapters progress.

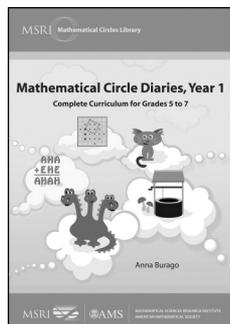
Contents: The construction of real and complex numbers; Metric and Euclidean spaces; Complete metric spaces; Normed linear spaces; Differentiation; Integration; Fourier analysis on locally compact

abelian groups; Sets, functions, and other basic ideas; Linear algebra; Bibliography; Index of terminology; Index of notation definitions.

Pure and Applied Undergraduate Texts, Volume 20

March 2013, approximately 370 pages, Hardcover, ISBN: 978-0-8218-9141-4, 2010 *Mathematics Subject Classification*: 15-01, 22B05, 26-01, 28-01, 42-01, 43-01, 46-01, **AMS members US\$59.20**, List US\$74, Order code AMSTEXT/20

General Interest



Mathematical Circle Diaries, Year 1

Complete Curriculum for Grades 5 to 7

Anna Burago, *Prime Factor Math Circle, Seattle, WA*

Early middle school is a great time for children to start their mathematical circle education. This time is a period of curiosity

and openness to learning. The thinking habits and study skills acquired by children at this age stay with them for a lifetime. Mathematical circles, with their question-driven approach and emphasis on creative problem-solving, have been rapidly gaining popularity in the United States. The circles expose children to the type of mathematics that stimulates development of logical thinking, creativity, analytical abilities and mathematical reasoning. These skills, while scarcely touched upon at school, are in high demand in the modern world.

This book contains everything that is needed to run a successful mathematical circle for a full year. The materials, distributed among 29 weekly lessons, include detailed lectures and discussions, sets of problems with solutions, and contests and games. In addition, the book shares some of the know-how of running a mathematical circle. The curriculum, which is based on the rich and long-standing Russian math circle tradition, has been modified and adapted for teaching in the United States. For the past decade, the author has been actively involved in teaching a number of mathematical circles in the Seattle area. This book is based on her experience and on the compilation of materials from these circles.

The material is intended for students in grades 5 to 7. It can be used by teachers and parents with various levels of expertise who are interested in teaching mathematics with the emphasis on critical thinking. Also, this book will be of interest to mathematically motivated children.

In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession.

Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI).

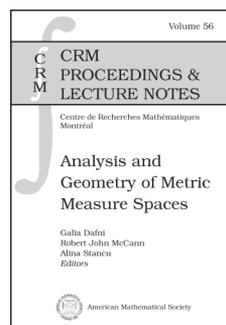
Contents: Preliminaries; *Session plans:* Introduction; How to solve a problem; Knights and liars; How to turn lies into truth; Mathematical auction; Word problems and common sense; More word problems; Odd and even numbers I. Magic paper cups; Odd and even numbers

II. Definitions and properties; Halloween math hockey I; Odd and even numbers III. Alternations; Weighings an counterfeit coins; Mathematical olympiad I; Meet the cube. First lesson in 3d geometry; Cross sections. Second lesson in 3d geometry; Mathematical auction; Combinatorics I; Combinatorics II; Mathematical hockey II; Numerical puzzles I. Runaway digits; Numerical puzzles II. Encrypted problems; Mathematical olympiad II; Divisibility I. Definition and properties; Divisibility II. Prime numbers and prime factorization; Mathematical auction; Divisibility III. Divisibility rules; Divisibility IV. Relatively prime numbers; Mathematical games of strategy I; Mathematical games of strategy II; Mathematical olympiad III; *Mathematical contests and competitions:* Mathematical contests; Mathematical auction; Mathematical hockey; Mathematical olympiads; Short entertaining math games; *More teaching advice:* How to be a great math circle teacher; Math circle day-to-day; More questions?; *Solutions:* Solutions; Bibliography.

MSRI Mathematical Circles Library, Volume 11

January 2013, 335 pages, Softcover, ISBN: 978-0-8218-8745-5, 2010 *Mathematics Subject Classification*: 97A20, 97A80, 00A07, 00A08, 00A09, 97D50, **AMS members US\$36**, List US\$45, Order code MCL/11

Geometry and Topology



Analysis and Geometry of Metric Measure Spaces

Lecture Notes of the 50th Séminaire de Mathématiques Supérieures (SMS), Montréal, 2011

Galia Dafni, *Concordia University, Montreal, QC, Canada*, Robert John McCann, *University of Toronto, ON, Canada*, and Alina Stancu, *Concordia University, Montreal, QC, Canada*

This book contains lecture notes from most of the courses presented at the 50th anniversary edition of the Séminaire de Mathématiques Supérieure in Montréal. This 2011 summer school was devoted to the analysis and geometry of metric measure spaces, and featured much interplay between this subject and the emergent topic of optimal transportation. In recent decades, metric measure spaces have emerged as a fruitful source of mathematical questions in their own right, and as indispensable tools for addressing classical problems in geometry, topology, dynamical systems, and partial differential equations. The summer school was designed to lead young scientists to the research frontier concerning the analysis and geometry of metric measure spaces, by exposing them to a series of minicourses featuring leading researchers who highlighted both the state-of-the-art and some of the exciting challenges which remain. This volume attempts to capture the excitement of the summer school itself, presenting the reader with glimpses into this active area of research and its connections with other branches of contemporary mathematics.

This item will also be of interest to those working in differential equations, analysis, and probability and statistics.

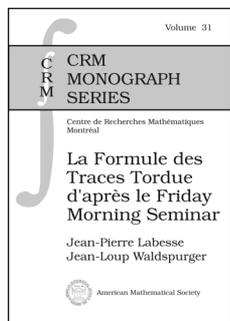
Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: L. Ambrosio, An overview on calculus and heat flow in metric measure spaces and spaces with Riemannian curvature bounded from below; M. T. Barlow, Analysis on the Sierpinski carpet; T. Coulhon, Heat kernel estimates, Sobolev-type inequalities and Riesz transform on noncompact Riemannian manifolds; G. David, Regularity of minimal and almost minimal sets and cones: J. Taylor's theorem for beginners; Y.-H. Kim, Lectures on Ma-Trudinger-Wang curvature and regularity of optimal transport maps; R. J. McCann and N. Guillen, Five lectures on optimal transportation: Geometry, regularity and applications; E. Milman, A proof of Bobkov's spectral bound for convex domains via Gaussian fitting and free energy estimation; Y. Ollivier, A visual introduction to Riemannian curvatures and some discrete generalizations.

CRM Proceedings & Lecture Notes, Volume 56

February 2013, approximately 228 pages, Softcover, ISBN: 978-0-8218-9418-7, 2010 *Mathematics Subject Classification*: 53C23; 35-06, 53-06, 58-06, 60-06, 49Q15, 49N60, **AMS members US\$79.20**, List US\$99, Order code CRMP/56

Number Theory



La Formule des Traces Tordue d'après le Friday Morning Seminar

Jean-Pierre Labesse, *Institut Mathématique de Luminy, Marseille, France*, and Jean-Loup Waldspurger, *Institut Mathématique de Jussieu, Paris, France*

The trace formula for an arbitrary connected reductive group over a number field was developed by James Arthur. The twisted case was the subject of the Friday Morning Seminar at the Institute for Advanced Study in Princeton during the 1983–1984 academic year. During this seminar, lectures were given by Laurent Clozel, Jean-Pierre Labesse and Robert Langlands. Having been written quite hastily, the lecture notes of this seminar were in need of being revisited. The authors' ambition is to give, following these notes, a complete proof of the twisted trace formula in its primitive version, i.e., its noninvariant form. This is a part of the project of the Parisian team led by Laurent Clozel and Jean-Loup Waldspurger. Their aim is to give a complete proof of the stable form of the twisted trace formula, and to provide the background for the forthcoming book by James Arthur on twisted endoscopy for the general linear group with application to symplectic and orthogonal groups.

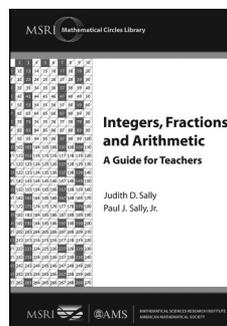
Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: *Géométrie et combinatoire*: Racines et convexes; Espaces tordus; Théorie de la réduction; *Théorie spectrale, troncatures et noyaux*: L'opérateur de troncature; Formes automorphes et produits scalaires; Le noyau intégral; Décomposition spectrale; *La formule*

des traces grossière: Formule des traces: état zéro; Développement géométrique; Développement spectral grossier; Formule des traces: propriétés formelles; *Forme explicite des termes spectraux*: Introduction d'une fonction B ; Calcul de $A^T(B)$; Formules explicites; Bibliographie; Index des notations.

CRM Monograph Series, Volume 31

February 2013, approximately 248 pages, Hardcover, ISBN: 978-0-8218-9441-5, 2010 *Mathematics Subject Classification*: 11F72; 11R56, 20G35, **AMS members US\$79.20**, List US\$99, Order code CRMM/31



Integers, Fractions and Arithmetic

A Guide for Teachers

Judith D. Sally, *Northwestern University, Evanston, IL*, and Paul J. Sally, Jr., *University of Chicago, IL*

This book, which consists of twelve interactive seminars, is a comprehensive and careful study of the fundamental topics

of K–8 arithmetic. The guide aims to help teachers understand the mathematical foundations of number theory in order to strengthen and enrich their mathematics classes. Five seminars are dedicated to fractions and decimals because of their importance in the classroom curriculum. The standard topics are covered in detail, but are arranged in an order that is slightly different from the usual one. Multiplication is treated first, and with that in hand, common denominators and equivalent fractions are more readily understood and are available for use when discussing addition.

The book is intended for the professional development of teachers. It is appropriate for teacher education programs as well as for enrichment programs such as Mathematical Circles for Teachers. There are numerous activities in each seminar that teachers can bring into their classrooms.

In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession.

Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI).

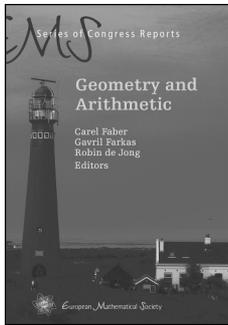
Contents: Number systems; Divisibility and order in the integers; GCD's and the division algorithm; Prime numbers and factorization into primes; Applications of prime power factorization; Modular arithmetic and divisibility tests; More modular arithmetic; The arithmetic of fractions; Properties of multiplication of fractions; Addition of fractions; The decimal expansion of a fraction; Order and the number line; The mysterious long division algorithm; The pigeonhole principle; Index.

MSRI Mathematical Circles Library, Volume 10

December 2012, 208 pages, Softcover, ISBN: 978-0-8218-8798-1, 2010 *Mathematics Subject Classification*: 11Axx, 97B50, 11-01, **AMS members US\$31.20**, List US\$39, Order code MCL/10

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Geometry and Arithmetic

Carel Faber, *Royal Institute of Technology, Stockholm, Sweden*, **Gavril Farkas**, *Humboldt University of Berlin, Germany*, and **Robin de Jong**, *University of Leiden, The Netherlands*, Editors

This volume contains 21 articles written by leading experts in the fields of algebraic and arithmetic geometry. The treated topics range over a variety of themes, including moduli spaces of curves and abelian varieties, algebraic cycles, vector bundles and coherent sheaves, curves over finite fields, and algebraic surfaces, among others.

The volume originates from the conference "Geometry and Arithmetic," which was held on the island of Schiermonnikoog in The Netherlands in September 2010.

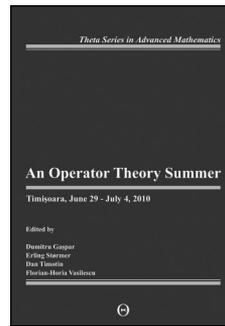
This item will also be of interest to those working in number theory.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: **V. Alexeev** and **D. Swinarski**, Nef divisors on $\bar{M}_{0,n}$ from GIT; **I. Bauer** and **F. Catanese**, Inoue type manifolds and Inoue surfaces: A connected component of the moduli space of surfaces with $K^2 = 7, p_g = 0$; **A. Beauville**, Non-rationality of the symmetric sextic Fano threefold; **C. Ciliberto** and **F. Flamini**, Brill-Noether loci of stable rank-two vector bundles on a general curve; **J. I. Cogolludo-Agustín** and **R. Kloosterman**, Mordell-Weil groups and Zariski triples; **J.-M. Couveignes** and **B. Edixhoven**, Approximate computations with modular curves; **F. Eusen** and **F.-O. Schreyer**, A remark on a conjecture of Paranjape and Ramanan; **A. Gibney**, On extensions of the Torelli map; **B. H. Gross**, The classes of singular moduli in the generalized Jacobian; **G. Harder**, The Eisenstein motive for the cohomology of $\mathrm{GSp}_2(\mathbb{Z})$; **J. Heinloth**, Cohomology of the moduli stack of coherent sheaves on a curve; **E. W. Howe** and **K. E. Lauter**, New methods for bounding the number of points on curves over finite fields; **H. Ito** and **S. Schröer**, Wildly ramified actions and surfaces of general type arising from Artin-Schreier curves; **T. Katsura** and **S. Kondō**, A note on a supersingular K3 surface in characteristic 2; **S. J. Kovács**, The intuitive definition of Du Bois singularities; **H. Lange** and **P. E. Newstead**, Bundles of rank 2 with small Clifford index on algebraic curves; **R. Pandharipande** and **A. Pixton**, Descendants on local curves: Stationary theory; **D. Petersen**, A remark on Getzler's semi-classical approximation; **R. Schoof**, On the modular curve $X_0(23)$; **C. Voisin**, Degree 4 unramified cohomology with finite coefficients and torsion codimension 3 cycles; **Y. G. Zarhin**, Poincaré duality and unimodularity.

EMS Series of Congress Reports, Volume 7

October 2012, 384 pages, Hardcover, ISBN: 978-3-03719-119-4, 2010 *Mathematics Subject Classification*: 14-XX, 11-XX, **AMS members US\$78.40**, List US\$98, Order code EMSSCR/7



An Operator Theory Summer

Timișoara, June 29–July 4, 2010

Dumitru Gaşpar, *West University of Timișoara, Romania*, **Erling Størmer**, *University of Oslo, Norway*, **Dan Timotin**, *Romanian Academy, Bucharest, Romania*, and **Florian-Horia Vasilescu**, *University of Lille I, Villeneuve d'Ascq, France*, Editors

This volume contains the proceedings of the 23rd International Conference on Operator Theory, held in Timișoara, Romania, from June 29 to July 4, 2010. It includes three survey articles on traces on a C^* -algebra, amalgamated products of C^* -bundles, and compactness of composition operators, as well as ten papers containing original research on several topics: single operator theory, C^* -algebras, moment problems, differential and integral operators, and complex function theory.

A publication of the Theta Foundation. Distributed worldwide, except in Romania, by the AMS.

Contents: **A. M. Bikchentaev**, Characterization of traces on C^* -algebras: A survey; **E. Blanchard**, Amalgamated products of C^* -bundles; **E. Boasso**, The Drazin spectrum in Banach algebras; **B. E. Breckner** and **C. Varga**, On problems involving the weak Laplacian operator on the Sierpinski gasket; **S. Grigorian** and **A. Kuznetsova**, On a category of nuclear C^* -algebras; **L. Lemnete-Ninulescu**, Truncated trigonometric and Hausdorff moment problems for operators; **N. Lupa** and **M. Megan**, Rolewicz type theorems for nonuniform exponential stability of evolution operators on the half-line; **M. Megan**, **T. Ceaușu**, and **L. Biriș**, On some concepts of stability and instability for cocycles of linear operators in Banach spaces; **H. Queffélec**, A tentative comparison of compactness of composition operators on Hardy-Orlicz and Bergman-Orlicz spaces; **F. Rădulescu**, A universal, non-commutative C^* -algebra associated to the Hecke algebra of double cosets; **C. Stoica** and **M. Megan**, On nonuniform exponential dichotomy for linear skew-evolution semiflows in Banach spaces; **L. Suciu** and **N. Suciu**, On the asymptotic limit of a bicontraction; **A. Totoi**, Integral operators applied on classes of meromorphic functions defined by subordination and superordination.

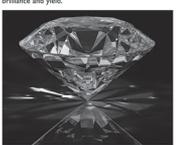
International Book Series of Mathematical Texts

June 2012, 148 pages, Hardcover, ISBN: 978-973-87899-8-2, 2010 *Mathematics Subject Classification*: 00B25, 46-06, 47-06, **AMS members US\$28.80**, List US\$36, Order code THETA/16

MATHEMATICAL MOMENTS

Being on the Cutting Edge

Cutters of diamonds and other gemstones have a high-pressure job with conflicting demands: Flaws must be removed from rough stones to maximize brilliance but done so in a way that yields the greatest weight possible. Because diamonds are often cut to a standard shape, cutting them is far less complex than cutting other gemstones such as rubies or sapphires, which can have hundreds of different shapes. By coupling geometry and multivariable calculus with optimization techniques, mathematicians have been able to devise algorithms that automatically generate precise cutting plans that maximize brilliance and yield.



AMS
www.ams.org/mathmoments

Getting a Handle on Obesity

Once a problem only in the developed world, obesity is now a worldwide epidemic. The overwhelming cause of the epidemic is a dramatic increase in the food supply and in food consumption—not a surprise. Yet there are still many mysteries about weight change that can't be answered either inside the lab because of the impracticality of keeping people isolated for long periods of time, or outside, because of the unreliability of dietary diaries. Mathematical models based on differential equations can help overcome this roadblock and allow detailed analysis of the relationship between food intake, metabolism, and weight change. The model's predictions fit existing data and explain such things as why it is hard to keep weight off and why obese people are more susceptible to further weight gain.



AMS
www.ams.org/mathmoments

Forecasting Crime

No one can predict who will commit a crime but in some cities math is helping detect areas where crimes have the greatest chance of occurring. Police then increase patrols in these "hot spots" in order to prevent crime. This innovative practice, called predictive policing, is based on large amounts of data collected from previous crimes, but it involves more than just maps and push pins. Predictive policing identifies hot spots by using algorithms similar to those used to predict aftershocks after major earthquakes. Just as aftershocks are more likely near a recent earthquake's epicenter, so too are crimes, as criminals do indeed return to, or very close to, the scene of a crime.



AMS
www.ams.org/mathmoments

Catching and Releasing

There's more mathematics involved in juggling than just trying to make sure that the number of balls (or chickens) that hit the ground stays at zero. Subjects such as combinatorics and abstract algebra help jugglers answer important questions, such as whether a particular juggling pattern can actually be juggled. For example, can balls be juggled so that the time period that each ball stays aloft alternates between five counts and one? The answer is "Yes." Math also tells you that the number of balls needed for such a juggling pattern is the average of the counts, in this case three.



AMS
www.ams.org/mathmoments

Finding Friends

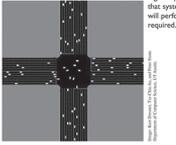
Facebook has over 700 million users with almost 70 billion connections. The hard part isn't people making friends; rather it's Facebook's computers sifting and accessing reams of data, including information about friends of friends. The latter is important for recommendations to users (People You May Know). Much of this work involves computer science, but mathematics also plays a significant role. Subjects such as linear programming and graph theory help cut in half the time needed to determine a person's friends and reduce network traffic on Facebook's machines by about two-thirds. What's next is that



AMS
www.ams.org/mathmoments

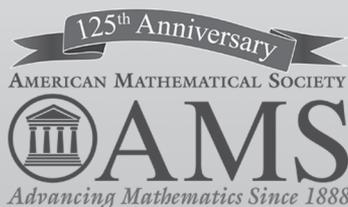
Putting the Auto in Automobile

It may be hard to accept but it's likely that we'd all be much safer in autonomous vehicles driven by computers, not humans. Annually more than 30,000 Americans die in car crashes, almost all due to human error. Autonomous vehicles will communicate position and speed to each other and avoid potential collisions—without the possibility of drifting off or road rage. There are still many legal (and insurance) issues to resolve, but researchers who are revving up the development of autonomous vehicles are relying on geometry for recognizing and tracking objects, probability to assess risk, and logic to prove that systems will perform as required.

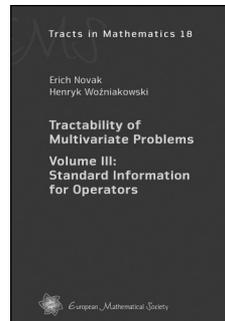


AMS
www.ams.org/mathmoments

See 100 Mathematical Moments, hear people talk about how they use math on the job in the modern world, and read translations in 13 languages at www.ams.org/mathmoments



Applications



Tractability of Multivariate Problems

Volume III: Standard Information for Operators

Erich Novak, University of Jena, Germany, and Henryk Woźniakowski, Columbia University, New York, NY

This is the third volume of a three-volume set comprising a comprehensive study of the tractability of multivariate problems. The third volume deals with algorithms using standard information consisting of function values. Linear and selected nonlinear operators are studied.

The most important example studied in volume III is the approximation of multivariate functions. Many other linear and some nonlinear problems are closely related to the approximation of multivariate functions. While the lower bounds obtained in volume I for the class of linear information also yield lower bounds for the standard class of function values, new techniques for upper bounds are presented in volume III. One of the main issues here is to verify when the power of standard information is nearly the same as the power of linear information. In particular, for the approximation problem defined over Hilbert spaces, the power of standard and linear information is the same in the randomized and average case (with Gaussian measures) settings, whereas in the worst case setting this is not true.

The book is of interest to researchers working in computational mathematics, especially in approximation of high-dimensional problems. It may be well suited for graduate courses and seminars. The text contains 58 open problems for future research in tractability.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Examples of multivariate approximation; Randomized setting; Multivariate approximation; Randomized setting: Linear problems; Average case setting: Multivariate approximation; Average case setting: Linear problems; Worse case setting: Multivariate approximation; Worse case setting: Linear problems; Nonlinear problems; Power of function values for multivariate approximation; List of open problems; Errata for volumes I and II; Bibliography; Index.

EMS Tracts in Mathematics, Volume 18

October 2012, 604 pages, Hardcover, ISBN: 978-3-03719-116-3, 2010 *Mathematics Subject Classification*: 65-02, 65Y20, 68Q17, 68Q25, 41A63, 46E22, 65N99, 65R20, 28C20, 46E30, AMS members US\$102.40, List US\$128, Order code EMSTM/18