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Algebra and Algebraic Geometry

Groups, Rings, Group Rings, and Hopf Algebras

Jeffrey Bergen, DePaul University, Chicago, IL, Stefan Catoiu, DePaul University, Chicago, IL, and William Chin, DePaul University, Chicago, IL, Editors

This volume contains the proceedings of the International Conference on Groups, Rings, Group Rings, and Hopf Algebras, held October 2–4, 2015 at Loyola University, Chicago, IL, and the AMS Special Session on Groups, Rings, Group Rings, and Hopf Algebras, held October 3–4, 2015, at Loyola University, Chicago, IL. Both conferences were held in honor of Donald S. Passman’s 75th birthday.

Centered in the area of group rings and algebras, this volume contains a mixture of cutting edge research topics in group theory, ring theory, algebras and their representations, Hopf algebras and quantum groups.


Contemporary Mathematics, Volume 688

Geometry and Dynamics in Gromov Hyperbolic Metric Spaces

With an Emphasis on Non-Proper Settings

Tushar Das, University of Wisconsin, La Crosse, WI, David Simmons, University of York, United Kingdom, and Mariusz Urbański, University of North Texas, Denton, TX

This book presents the foundations of the theory of groups and semigroups acting isometrically on Gromov hyperbolic metric spaces. Particular emphasis is paid to the geometry of their limit sets and on behavior not found in the proper setting. The authors provide a number of examples of groups which exhibit a wide range of phenomena not to be found in the finite-dimensional theory. The book contains both introductory material to help beginners as well as new research results, and closes with a list of attractive unsolved problems.

Contents: Preliminaries: Algebraic hyperbolic spaces; R-trees, CAT(1) spaces, and Gromov hyperbolic metric spaces; More about the geometry of hyperbolic metric spaces; Discreteness; Classification of isometries and semigroups; Limit sets; The Bishop-Jones theorem: The modified Poincaré exponent; Generalization of the Bishop-Jones theorem; Examples: Schottky products; Parabolic groups; Geometrically finite and...
convex-cobounded groups; Counterexamples; R-trees and their isometry groups; Patterson-Sullivan theory: Conformal and quasiconformal measures; Patterson-Sullivan theorem for groups of divergence type; Quasiconformal measures of geometrically finite groups; Open problems; Index of defined terms; Bibliography.

**Mathematical Surveys and Monographs**, Volume 218

**Problems in Abstract Algebra**
A. R. Wadsworth, University of California, San Diego, CA
This is a book of problems in abstract algebra for strong undergraduates or beginning graduate students. It can be used as a supplement to a course or for self-study. The book provides more variety and more challenging problems than are found in most algebra textbooks. It is intended for students wanting to enrich their learning of mathematics by tackling problems that take some thought and effort to solve. The book contains problems on groups (including the Sylow Theorems, solvable groups, presentation of groups by generators and relations, and structure and duality for finite abelian groups); rings (including basic ideal theory and factorization in integral domains and Gauss’s Theorem); linear algebra (emphasizing linear transformations, including canonical forms); and fields (including Galois theory). Hints to many problems are also included.

**Contents:** Integers and integers mod $n$; Groups; Rings; Linear algebra and canonical forms of linear transformations; Fields and Galois theory; Suggestions for further reading; Bibliography; Index of notation; Subject and terminology index.

**Student Mathematical Library**, Volume 82

**Analysis**

**Problems and Recent Methods in Operator Theory**
Fernanda Botelho, University of Memphis, TN, Raena King, Christian Brothers University, Memphis, TN, and T. S. S. R. K. Rao, Indian Statistical Institute, Bangalore, India, Editors

This volume contains the proceedings of the Workshop on Problems and Recent Methods in Operator Theory, held at the University of Memphis, Memphis, TN, from October 15–16, 2015 and the AMS Special Session on Advances in Operator Theory and Applications, in Memory of James Jamison, held at the University of Memphis, Memphis, TN, from October 17–18, 2015.

Operator theory is at the root of several branches of mathematics and offers a broad range of challenging and interesting research problems. It also provides powerful tools for the development of other areas of science including quantum theory, physics and mechanics. Isometries have applications in solid-state physics. Hermitian operators play an integral role in quantum mechanics very much due to their “nice” spectral properties. These powerful connections demonstrate the impact of operator theory in various branches of science.

The articles in this volume address recent problems and research advances in operator theory. Highlighted topics include spectral, structural and geometric properties of special types of operators on Banach spaces, with emphasis on isometries, weighted composition operators, multi-circular projections on function spaces, as well as vector valued function spaces and spaces of analytic functions.

This volume gives a succinct overview of state-of-the-art techniques from operator theory as well as applications to classical problems and long-standing open questions.

T. Miura and H. Takagi, Surjective isometries on the Banach space of continuously differentiable functions; L. Molnár, The arithmetic, geometric and harmonic means in operator algebras and transformations among them; B. Randrianantoanina, On sign embeddings and narrow operators on $L_2$; T. S. S. R. K. Rao, Into isometries that preserve finite dimensional structure of the range; J. E. Stovall and W. A. Feldman, Associating linear and nonlinear operators; D. Thompson, Normality properties of weighted composition operators on $H^2$.

Contemporary Mathematics, Volume 687

An Introduction to the Theory of Higher-Dimensional Quasiconformal Mappings
Frederick W. Gehring, Gaven J. Martin, Massey University, Auckland, New Zealand, and Bruce P. Palka, National Science Foundation, Arlington, VA

This book offers a modern, up-to-date introduction to quasiconformal mappings from an explicitly geometric perspective, emphasizing both the extensive developments in mapping theory during the past few decades and the remarkable applications of geometric function theory to other fields, including dynamical systems, Kleinian groups, geometric topology, differential geometry, and geometric group theory. It is a careful and detailed introduction to the higher-dimensional theory of quasiconformal mappings from the geometric viewpoint, based primarily on the technique of the conformal modulus of a curve family. Notably, the final chapter describes the application of quasiconformal mapping theory to Mostow’s celebrated rigidity theorem in its original context with all the necessary background.

This book will be suitable as a textbook for graduate students and researchers interested in beginning to work on mapping theory problems or learning the basics of the geometric approach to quasiconformal mappings. Only a basic background in multidimensional real analysis is assumed.

Contents: Introduction; Topology and analysis; Conformal mappings in Euclidean space; The moduli of curve families; Rings and condensers; Quasiconformal mappings; Mapping problems; The Tukia-Väisälä extension theorem; The Mostow rigidity theorem and discrete Möbius groups; Basic notation; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 216

The Projective Heat Map
Richard Evan Schwartz, Brown University, Providence, RI

This book introduces a simple dynamical model for a planar heat map that is invariant under projective transformations. The map is defined by iterating a polygon map, where one starts with a finite planar $N$-gon and produces a new $N$-gon by a prescribed geometric construction. One of the appeals of the topic of this book is the simplicity of the construction that yet leads to deep and far reaching mathematics. To construct the projective heat map, the author modifies the classical affine invariant midpoint map, which takes a polygon to a new polygon whose vertices are the midpoints of the original.

The author provides useful background which makes this book accessible to a beginning graduate student or advanced undergraduate as well as researchers approaching this subject from other fields of specialty. The book includes many illustrations, and there is also a companion computer program.

Contents: Introduction; Part 1: Some other polygon iterations; A primer on projective geometry; Elementary algebraic geometry; The pentagram map; Some related dynamical systems; Part 2: The projective heat map; Topological degree of the map; The convex case; The basic domains; The method of positive dominance; The Cantor set; Towards the quasi horseshoe; The quasi horseshoe; Part 3: Sketches for the remaining results; Towards the solenoid; The solenoid; Local structure of the Julia set; The embedded graph; Connectedness of the Julia set; Terms, formulas, and coordinate listings; References.

Mathematical Surveys and Monographs, Volume 219

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New AMS-Distributed Publications

Analysis

**Operator Theory: The State of the Art**
Conference Proceedings, Timişoara, June 30–July 5, 2014

Dumitru Gaspar, West University of Timişoara, Romania, Marius Junge, University of Illinois, Urbana, IL, Dan Timotin, Romanian Academy, Institute of Mathematics, Bucharest, Romania, and Florian-Horia Vasilescu, University of Lille I, Villeneuve d’Ascq, France, Editors

This volume contains the proceedings of the 25th International Conference in Operator Theory, held in Timişoara, Romania, between June 30 and July 5, 2014. Leading experts in the field have contributed several survey papers. The subjects covered include truncated moment problems and comparison of projections in a $C^*$-algebra.

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

**Degenerate Complex Monge–Ampère Equations**

Vincent Guedj, Université Paul Sabatier, Toulouse, France, and Ahmed Zeriahi, Université Paul Sabatier, Toulouse, France

Complex Monge–Ampère equations have been one of the most powerful tools in Kähler geometry since Aubin and Yau’s classical works, culminating in Yau’s solution to the Calabi conjecture. A notable application is the construction of Kähler–Einstein metrics on some compact Kähler manifolds. In recent years degenerate complex Monge–Ampère equations have been intensively studied, requiring more advanced tools.

The main goal of this book is to give a self-contained presentation of the recent developments of pluripotential theory on compact Kähler manifolds and its application to Kähler–Einstein metrics on mildly singular varieties. After reviewing basic properties of plurisubharmonic functions, Bedford–Taylor’s local theory of complex Monge–Ampère measures is developed. In order to solve degenerate complex Monge–Ampère equations on compact Kähler manifolds, fine properties of quasi-plurisubharmonic functions are explored, classes of finite energies defined, and various maximum principles established. After proving Yau’s celebrated theorem as well as its recent generalizations, the results are then used to solve the (singular) Calabi conjecture and to construct (singular) Kähler–Einstein metrics on some varieties with mild singularities.

This book is accessible to advanced students and researchers of complex analysis and differential geometry.

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

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

EMS Tracts in Mathematics, Volume 26

Differential Equations

**PDE Models for Chemotaxis and Hydrodynamics in Supercritical Function Spaces**

Hans Triebel, University of Jena, Germany

This book deals with PDE models for chemotaxis (the movement of biological cells or organisms in response of chemical gradients) and hydrodynamics (viscous, homogeneous, and incompressible fluid filling the entire space). The underlying Keller–Segel equations (chemotaxis), Navier–Stokes equations (hydrodynamics), and their numerous modifications and combinations are treated in the context of inhomogeneous spaces of Besov–Sobolev type. The author pays special attention to mapping properties of related nonlinearities. Further models are considered, including (deterministic) Fokker–Planck equations and chemotaxis Navier–Stokes equations.

These notes are addressed to graduate students and mathematicians with a working knowledge of basic elements of
the theory of function spaces, especially of Besov–Sobolev type, and an interest in mathematical biology and physics. This item will also be of interest to those working in analysis.

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

EMS Series of Lectures in Mathematics, Volume 27

Probability and Statistics

Asymptotic Theory of Transaction Costs
Walter Schachermayer,
University of Vienna, Austria

A classical topic in mathematical finance is the theory of portfolio optimization. Robert Merton’s work from the early seventies had enormous impact on academic research as well as on the paradigms guiding practitioners. One of the ramifications of this topic is the analysis of (small) proportional transaction costs, such as a Tobin tax.

These lecture notes present some striking recent results of the asymptotic dependence of the relevant quantities when transaction costs tend to zero. An appealing feature of the consideration of transaction costs is that it allows us for the first time to reconcile the no arbitrage paradigm with the use of non-semimartingale models, such as fractional Brownian motion. This leads to the culminating theorem of the present lectures, which roughly reads as follows: For a fractional Brownian motion stock price model we always find a shadow price process for given transaction costs. This process is a semimartingale and can therefore be dealt with using the usual machinery of mathematical finance.

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

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

Zurich Lectures in Advanced Mathematics, Volume 23

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