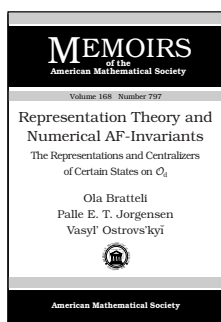


New Publications Offered by the AMS

Analysis



Representation Theory and Numerical AF-Invariants

The Representations and Centralizers of Certain States on \mathcal{O}_d

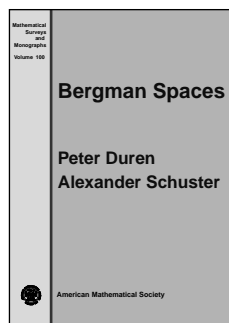
Ola Bratteli, *Mathematics Institute, Oslo*, Palle E. T.

Jorgensen, *University of Iowa, Iowa City*, and Vasyi' Ostrovs'kyi, *National Academy of Sciences of Ukraine, Kiev*

Contents: Part A. Representation theory; Part B. Numerical AF-invariants; Bibliography; List of figures; List of tables; List of terms and symbols.

Memoirs of the American Mathematical Society, Volume 168, Number 797

March 2004, 178 pages, Softcover, ISBN 0-8218-3491-6, 2000 *Mathematics Subject Classification*: 46L30, 46L55, 46L89, 47A13, 47A67; 47A20, 43A65, **Individual member \$38**, List \$63, Institutional member \$50, Order code MEMO/168/797N



Bergman Spaces

Peter Duren, *University of Michigan, Ann Arbor*, and Alexander Schuster, *San Francisco State University, CA*

Over the last ten years, the theory of Bergman spaces has undergone a remarkable metamorphosis. In a series of major advances, central problems once considered intractable were solved, and a rich theory emerged.

Although progress continues, the time seems ripe for a full

and unified account of the subject, weaving the old and new results together. This thorough exposition provides just that.

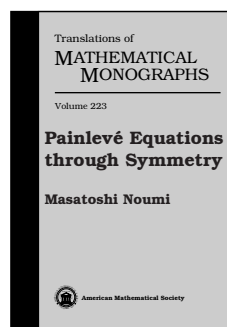
The subject of Bergman spaces is a masterful blend of complex function theory with functional analysis and operator theory. It has much in common with Hardy spaces, but involves new elements such as hyperbolic geometry, reproducing kernels, and biharmonic Green functions.

In this book, the authors develop background material and provide a self-contained introduction to a broad range of topics, including recent advances on interpolation and sampling, contractive zero-divisors, and invariant subspaces. The book is accessible to researchers and advanced graduate students who have studied basic complex function theory, measure theory, and functional analysis.

Contents: Overview; The Bergman kernel function; Linear space properties; Analytic properties; Zero-sets; Contractive zero-divisors; Sampling and interpolation; Proofs of sampling and interpolation theorems; Invariant subspaces; Structure of invariant subspaces; References; Index.

Mathematical Surveys and Monographs, Volume 100

March 2004, 318 pages, Hardcover, ISBN 0-8218-0810-9, 2000 *Mathematics Subject Classification*: 30H05, 46E15, 30D55, **All AMS members \$63**, List \$79, Order code SURV/100N



Painlevé Equations through Symmetry

Masatoshi Noumi, *Kobe University, Japan*

"The Painlevé equations themselves are really a wonder. They still continue to give us fresh mysteries ... One reason that I wrote this book is to tell you how impressed I am by the mysteries of the Painlevé equations."

—from the *Preface*

The six Painlevé equations (nonlinear ordinary differential equations of the second order with nonmovable singularities) have attracted the attention of mathematicians for more than 100 years. These equations and their solutions, the Painlevé transcendents, nowadays play an important role in many areas of mathematics, such as the theory of special functions, the theory of integrable systems, differential geometry, and mathematical aspects of quantum field theory.

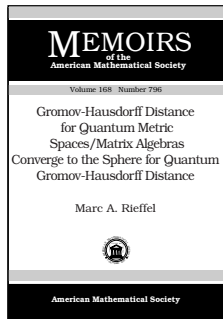
The present book is devoted to the symmetry of Painlevé equations (especially those of types II and IV). The author studies families of transformations for several types of Painlevé equations—the so-called Bäcklund transformations—which transform solutions of a given Painlevé equation to solutions of the same equation with a different set of parameters. It turns out that these symmetries can be interpreted in terms of root systems associated to affine Weyl groups. The author describes the remarkable combinatorial structures of these symmetries, and shows how they are related to the theory of τ -functions associated to integrable systems.

Prerequisites include undergraduate calculus and linear algebra with some knowledge of group theory. The book is suitable for graduate students and research mathematicians interested in special functions and the theory of integrable systems.

Contents: What is a Bäcklund transformation?; The symmetric form; τ -functions; τ -functions on the lattice; Jacobi-Trudi formula; Getting familiar with determinants; Gauss decomposition and birational transformations; Lax formalism; Appendix; Bibliography; Index.

Translations of Mathematical Monographs, Volume 223

March 2004, approximately 168 pages, Hardcover, ISBN 0-8218-3221-2, LC 2003062828, 2000 *Mathematics Subject Classification*: 34M55; 37K35, 37K10, 39Axx, 14E05, 20F55, **All AMS members \$55**, List \$69, Order code MMONO/223N



Gromov-Hausdorff Distance for Quantum Metric Spaces/Matrix Algebras Converge to the Sphere for Quantum Gromov-Hausdorff Distance

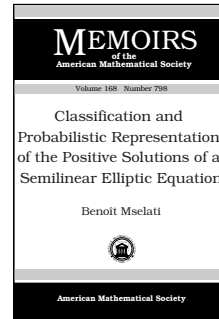
Marc A. Rieffel, *University of California, Berkeley*

Contents: Gromov-Hausdorff distance for quantum metric spaces; Bibliography; Matrix algebras Converge to the sphere for quantum Gromov-Hausdorff distance; Bibliography.

Memoirs of the American Mathematical Society, Volume 168, Number 796

March 2004, 91 pages, Softcover, ISBN 0-8218-3518-1, 2000 *Mathematics Subject Classification*: 46L87; 53C23, 58B34, 60B10, **Individual member \$32**, List \$54, Institutional member \$43, Order code MEMO/168/796N

Differential Equations



Classification and Probabilistic Representation of the Positive Solutions of a Semilinear Elliptic Equation

Benoît Mselati

Contents: An analytic approach to the equation $\Delta u = u^2$; A probabilistic approach to the equation $\Delta u = u^2$; Lower bounds for solutions; Upper bounds for solutions; The classification and representation of the solutions of $\Delta u = u^2$ in a domain; Appendix A. Technical results; Appendix. Bibliography; Notation index; Subject index.

Memoirs of the American Mathematical Society, Volume 168, Number 798

March 2004, 121 pages, Softcover, ISBN 0-8218-3509-2, 2000 *Mathematics Subject Classification*: 35J65; 35J60, 35C99, 60J80, **Individual member \$34**, List \$56, Institutional member \$45, Order code MEMO/168/798N

General and Interdisciplinary



The Number π

Pierre Eymard and Jean-Pierre Lafon

[In the book] we are dealing with a theme which cuts across the mathematics courses classically taught in the first four years of college. Thus it offers the reader the opportunity to learn, review and give long-term thought to the concepts covered in these programmes by following the guiding thread of this favoured number.

—from the *Preface*

This is a clever, beautiful book. The authors trace the thread of π through the long history of mathematics. In so doing, they touch upon many major subjects in mathematics: geometry (of course), number theory, Galois theory, probability, transcendental numbers, analysis, and, as their crown jewel, the theory of elliptic functions, which connects many of the other subjects.

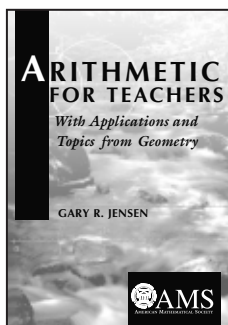
By this device, the authors provide a tour through mathematics, one that mathematicians of all levels, amateur or professional, may appreciate. In many cases, the tour visits well-known topics from particular special interest groups. Remarkably, π is often found at the places of deepest beauty.

The volume includes many exercises with detailed solutions. Anyone from undergraduate mathematics majors through university professors will find many things to enjoy in this book.

Contents: Measurement of the circle; Wallis's formula and some others; Euler, Euler again, always Euler; Squaring the circle; π and elliptic integrals; Solutions to the exercises; Bibliography; Index.

February 2004, approximately 322 pages, Softcover, ISBN 0-8218-3246-8, 2000 *Mathematics Subject Classification*: 11-01, 11-02; 11J89, 11Y60, **All AMS members \$29**, List \$36, Order code TNPN

Arithmetic for Teachers



With Applications and Topics from Geometry

Gary R. Jensen, *Washington University, St. Louis, MO*

Excellent teaching of mathematics at the elementary school level requires teachers to be experts in school mathematics. This textbook helps prospective teachers achieve the necessary expertise by presenting topics from the K-6 mathematics curriculum at a greater depth than is

found in most classrooms. The knowledge that comes from this approach gives prospective teachers essential insight into how topics interrelate and where difficulties may lie.

Information is presented at a pace that makes it interesting, rewarding, and enjoyable. With the deeper mathematical preparation inherent in this book, prospective teachers will come away knowing how to explain concepts, demonstrate computational procedures, and lead students through problem-solving techniques. Both students and teachers will find this book key to learning the necessary material and knowing how to express it at the right level.

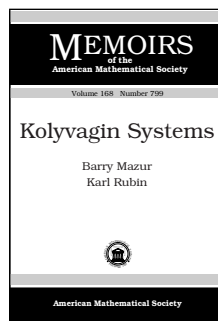
The primary focus is on the foundations of arithmetic, along with a selection of topics from geometry, and a wide range of applications. The number line is used throughout to visualize concepts and to tie them to solutions. The book emphasizes explanations of concepts, of how to solve problems, and of how the concepts relate to the solutions of the problems.

This is a textbook for a college course in mathematics for prospective elementary school teachers. It will also be an excellent reference source for instructors of such courses.

Contents: Counting; Whole number arithmetic; Whole number computation; Number theory; Rational numbers; Decimals; Integers; Clock arithmetic; RSA encryption; Bibliography; Index.

December 2003, 383 pages, Hardcover, ISBN 0-8218-3418-5, LC 2003060517, 2000 *Mathematics Subject Classification*: 97-01, 97B50, 97D50, 00A06, **All AMS members \$47**, List \$59, Order code FOAN

Number Theory



Kolyvagin Systems

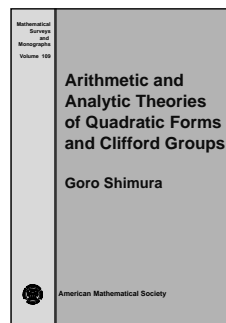
Barry Mazur, *Harvard University, Cambridge, MA*, and **Karl Rubin**, *Stanford University, CA*

Contents: Introduction; Local cohomology groups; Global cohomology groups and Selmer structures; Kolyvagin systems; Kolyvagin systems over principal artinian rings; Kolyvagin systems over integral domains; Exam-

ples; Appendix A. Proof of Theorem 3.2.4; Appendix B. Proof of Theorem 4.3.3, by Benjamin Howard; Bibliography.

Memoirs of the American Mathematical Society, Volume 168, Number 799

February 2004, 96 pages, Softcover, ISBN 0-8218-3512-2, 2000 *Mathematics Subject Classification*: 11G40, 11F80; 11R23, 11R34, 11R42, **Individual member \$32**, List \$54, Institutional member \$43, Order code MEMO/168/799N



Arithmetic and Analytic Theories of Quadratic Forms and Clifford Groups

Goro Shimura, *Princeton University, NJ*

In this book, award-winning author Goro Shimura treats new areas and presents relevant expository material in a clear and readable style. Topics

include Witt's theorem and the Hasse principle on quadratic forms, algebraic theory of Clifford algebras, spin groups, and spin representations. He also includes some basic results not readily found elsewhere.

The two principle themes are:

- (1) Quadratic Diophantine equations;
- (2) Euler products and Eisenstein series on orthogonal groups and Clifford groups.

The starting point of the first theme is the result of Gauss that the number of primitive representations of an integer as the sum of three squares is essentially the class number of primitive binary quadratic forms. Presented are a generalization of this fact for arbitrary quadratic forms over algebraic number fields and various applications. For the second theme, the author proves the existence of the meromorphic continuation of a Euler product associated with a Hecke eigenform on a Clifford or an orthogonal group. The same is done for an Eisenstein series on such a group.

Beyond familiarity with algebraic number theory, the book is mostly self-contained. Several standard facts are stated with references for detailed proofs.

Goro Shimura won the 1996 Steele Prize for Lifetime Achievement for "his important and extensive work on arithmetical geometry and automorphic forms".

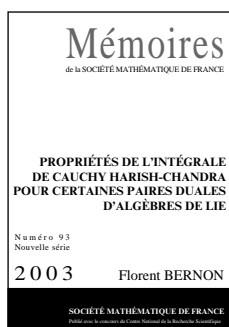
This item will also be of interest to those working in algebra and algebraic geometry.

Contents: Introduction; Algebraic theory of quadratic forms, Clifford algebras, and spin groups; Quadratic forms, Clifford groups, and spin groups over a local or global field; Quadratic diophantine equations; Groups and symmetric spaces over \mathbb{R} ; Euler products and Eisenstein series on orthogonal groups; Euler products and Eisenstein series on Clifford groups; Appendix; References; Frequently used symbols; Index.

Mathematical Surveys and Monographs, Volume 109

March 2004, 275 pages, Hardcover, ISBN 0-8218-3573-4, LC 2003063826, 2000 *Mathematics Subject Classification*: 11D09, 11E08, 11E12, 11E25, 11E41, 11Fxx, 15A66, 22E99, **All AMS members \$55**, List \$69, Order code SURV/109N

More Publications Available from the AMS



Propriétés de l'intégrale de Cauchy Harish-Chandra pour certaines paires duales d'algèbres de Lie

Florent Bernon, *Université Paris, Villetaneuse, France*

In this book, *Properties of the Cauchy Harish-Chandra Integral for Some Dual Pairs of Lie Algebras*, the author considers a symplectic group Sp and an irreducible dual pair (G, G') in Sp in the manner of R. Howe. Let \mathfrak{g} (resp. \mathfrak{g}') be the Lie algebra of G (resp. G'). The main topic of the book is the map \mathbf{Chc} , called the Cauchy Harish-Chandra integral, from the space of smooth compactly supported functions of \mathfrak{g} to the space of functions defined on the open set $\mathfrak{g}'^{\text{reg}}$ of semisimple regular elements of \mathfrak{g}' . It is proved that these functions are invariant integrals if G and G' are linear groups and behave locally like invariant integrals if G and G' are unitary groups of same rank. In this last case, the author obtains the jump relations up to a multiplicative constant which only depends on the dual pair.

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: Introduction; Propriétés de \mathbf{Chc} pour les paires de type II; Définition de \mathbf{Chc} pour les paires duales unitaires; Propriétés de \mathbf{Chc} si G et G' sont de rang 2; Propriétés des intégrales invariantes; Propriétés de \mathbf{Chc} si G et G' sont de même rang; Bibliographie.

Mémoires de la Société Mathématique de France, Number 93

September 2003, 135 pages, Softcover, ISBN 2-85629-137-6, 2000 *Mathematics Subject Classification*: 22E46, **Individual member \$32**, List \$36, Order code SMFMEM/93N