A COURSE IN LINEAR ALGEBRA WITH APPLICATIONS
(2nd Edition)
by Derek J S Robinson (University of Illinois at Urbana-Champaign, USA)

This is the second edition of the best-selling introduction to linear algebra. Presupposing no knowledge beyond calculus, it provides a thorough treatment of all the basic concepts, such as vector space, linear transformation and inner product. The concept of a quotient space is introduced and related to solutions of linear system of equations, and a simplified treatment of Jordan normal form is given.

Numerous applications of linear algebra are described, including systems of linear recurrence relations, systems of linear differential equations, Markov processes, and the Method of Least Squares. An entirely new chapter on linear programming introduces the reader to the simplex algorithm with emphasis on understanding the theory behind it.

Contents: Matrix Algebra; Systems of Linear Equations; Determinants; Introduction to Vector Spaces; Basis and Dimension; Linear Transformations; Orthogonality in Vector Spaces; Eigenvectors and Eigenvalues; More Advanced Topics; Linear Programming.

Key Features
• Proceeds at a gentle pace, yet provides full proofs
• Includes a new chapter on linear programming

THE UNIVERSAL MANDELBROT SET
Beginning of the Story
by V Dolotin & A Morozov (ITEP Russia)

This book is devoted to the structure of the Mandelbrot set — a remarkable and important feature of modern theoretical physics, related to chaos and fractals and simultaneously to analytical functions, Riemann surfaces, phase transitions and string theory. The Mandelbrot set is one of the bridges connecting the world of chaos and order.

The authors restrict consideration to discrete dynamics of a single variable. This restriction preserves the most essential properties of the subject, but drastically simplifies computer simulations and the mathematical formalism.

The coverage includes a basic description of the structure of the set of orbits and pre-orbits associated with any map of an analytic space into itself. A detailed study of the space of orbits (the algebraic Julia set) as a whole, together with related attributes, is provided. Also covered are: moduli space in the space of maps and the classification problem for analytic maps, the relation of the moduli space to the bifurcations (topology changes) of the set of orbits, a combinatorial description of the moduli space (Mandelbrot and secondary Mandelbrot sets) and the corresponding invariants (discriminants and resultants), and the construction of the universal discriminant of analytic functions in terms of series coefficients. The book concludes by solving the case of the quadratic map using the theory and methods discussed earlier.

Contents: Notions and Notation; Summary; Fragments of Theory; Map f(x) = x^2 + c. From Standard Example to General Conclusions.

SELECTED PAPERS OF WANG YUAN
edited by Wang Yuan (Chinese Academy of Sciences, China)

ANALYTIC NUMBER THEORY
An Introductory Course
by Paul T Bateman & Harold G Diamond (University of Illinois at Urbana-Champaign)

GALOIS’ THEORY OF ALGEBRAIC EQUATIONS
by Jean-Pierre Tignol (Université Catholique de Louvain, Belgium)
GEOMETRIC LINEAR ALGEBRA
(Volume 1)
by I-Hsiung Lin (National Taiwan Normal University, China)

This accessible book for beginners uses intuitive geometric concepts to create abstract algebraic theory with a special emphasis on geometric characterizations. The book applies known results to describe various geometries and their invariants, and presents problems concerned with linear algebra, such as in real and complex analysis, differential equations, differentiable manifolds, differential geometry, Markov chains and transformation groups. The clear and inductive approach makes this book unique among existing books on linear algebra both in presentation and in content.

Contents: The Affine and Linear Structures of R1, R2 and R3: The One-Dimensional Real Vector Space R (or R1); The Two-Dimensional Real Vector Space R2; The Three-Dimensional Real Vector Space R3.

Key Features
• Contains over 250 figures and numerous examples and challenging exercises
• Provides intensive applications of eigenvalues to geometric problems
• Almost every algebraic (computational) process is guided by some geometric way of thinking or by the use of graphics

880pp    Mar 2005
981-256-087-4  US$98 £60
981-256-132-3(pbk)  US$54 £33

LECTURES ON ALGEBRA
Volume I
by S S Abhyankar (Purdue University, USA)

This book is a timely survey of much of the algebra developed during the last several centuries including its applications to algebraic geometry and its potential use in geometric modeling.

The present volume makes an ideal textbook for an abstract algebra course, while the forthcoming sequel, Lectures on Algebra II, will serve as a textbook for a linear algebra course. The author’s fondness for algebraic geometry shows up in both volumes, and his recent preoccupation with the applications of group theory to the calculation of Galois groups is evident in the second volume which contains more local rings and more algebraic geometry. Both books are based on the author’s lectures at Purdue University over the last few years.

Contents: Quadratic Equations; Curves and Surfaces; Tangents and Polars; Varieties and Models; Projective Varieties; Pause and Refresh.

Key Features
• A self-contained survey of the field
• The first three lectures constitute a booklet for a basic abstract algebra course
• The fourth lecture is a booklet on commutative algebra

756pp    Jul 2006
981-256-826-3  US$88 £51

AUTOMORPHIC REPRESENTATIONS OF LOW RANK GROUPS
by Yuval Z Flicker (The Ohio State University, USA)

The book develops the technique of comparison of twisted and stabilized trace formulae and considers the “Fundamental Lemma” on orbital integrals of spherical functions. Comparison of trace formulae is simplified using “regular” functions and the “lifting” is stated and proved by means of character relations.

This permits an intrinsic definition of partition of the automorphic representations of SL(2) into packets, and a definition of packets for U(3), a proof of multiplicity one theorem and rigidity theorem for SL(2) and for U(3), a determination of the self-contragredient representations of PGL(3) and those on GL(3, E) fixed by transpose-inverse-bar. In particular, the multiplicity one theorem is new and recent.

Contents: On the Symmetric Square Lifting; Functoriality and Norms; Orbital Integrals; Twisted Trace Formula; Total Global Comparison; Applications of a Trace Formula; Computation of a Twisted Character; Automorphic Representations of the Unitary Group U(3, E/F); Local Theory; Trace Formula; Liftings and Packets; Zeta Functions of Shimura Varieties of U(3): Automorphic Representations; Local Terms; Real Representations; Galois Representations.

Key Features
• Deals with the simplest testing-ground cases of a principal method in the confluence of contemporary number theory, representation theory, and arithmetic geometry
• A unified presentation — not just a collection of reprints — by an expert, and in many cases the originator, of the subject matter
• Accessible to students, yet of interest to experts
• Derives most of the important results through simpler techniques than often used in the area
• Fully updated to include significant new research

500pp    Jun 2006
981-256-803-4  US$87 £50
CONTINUED FRACTIONS
by Doug Hensley (Texas A&M University, USA)

The Euclidean algorithm is one of the oldest in mathematics, while the study of continued fractions as tools of approximation goes back at least to Euler and Legendre. While our understanding of continued fractions and related methods for simultaneous diophantine approximation has burgeoned over the course of the past decade and more, many of the results have not been brought together in book form. Continued fractions have been studied from the perspective of number theory, complex analysis, ergodic theory, dynamic processes, analysis of algorithms, and even theoretical physics, which has further complicated the situation.

This book places special emphasis on continued fraction Cantor sets and the Hausdorff dimension, algorithms and analysis of algorithms, and multi-dimensional algorithms for simultaneous diophantine approximation. Extensive, attractive computer-generated graphics are presented, and the underlying algorithms are discussed and made available.

Contents: Generalizations of the gcd and the Euclidean Algorithm; Continued Fractions with Small Partial Quotients; Ergodic Theory; Complex Continued Fractions; Multidimensional Diophantine Approximation; Powers of an Algebraic Integer; Marshall Hall’s Theorem; Functional-Analytic Techniques; The Generating Function Method; Conformal Iterated Function Systems; Convergence of Continued Fractions.

260pp  Mar 2006
981-256-477-2 US$78 £45

STRUCTURE OF HILBERT SPACE OPERATORS
by Chunlan Jiang (Hebei Normal University, China) & Zongyao Wang (East China University of Science and Technology, China)

This book exposes the internal structure of non-self-adjoint operators acting on complex separable infinite dimensional Hilbert space, by analyzing and studying the commutant of operators. A unique presentation of the theorem of Cowen–Douglas operators is given. The authors take the strongly irreducible operator as a basic model, and find complete similarity invariants of Cowen–Douglas operators by using K-theory, complex geometry and operator algebra tools.


Key Features
• Explores the frontiers of the subject through a unified treatment and organization reach the frontier of this subject
• Accessible to postgraduate students armed with the basics of operator theory and operator algebras

260pp  Mar 2006
981-256-616-3 US$58 £33
AUTOMORPHIC FORMS AND SHIMURA VARIETIES OF PGSp(2)
by Yuval Z Flicker (The Ohio State University, USA)

The area of automorphic representations is a natural continuation of studies in the 19th and 20th centuries on number theory and modular forms. A guiding principle is a reciprocity law relating infinite dimensional automorphic representations with finite dimensional Galois representations. Simple relations on the Galois side reflect deep relations on the automorphic side, called “liftings.” This in-depth book concentrates on an initial example of the lifting, from a rank 2 symplectic group PGSp(2) to PGL(4), reflecting the natural embedding of PGSp(2) in SL(4, C). It develops the technique of comparing twisted and stabilized trace formulae. It gives a detailed classification of the automorphic and admissible representation of the rank two symplectic PGSp(2) by means of a definition of packets and quasi-packets, using character relations and trace formulae identities. It also shows multiplicity one and rigidity theorems for the discrete spectrum.

Applications include the study of the decomposition of the cohomology of an associated Shimura variety, thereby linking Galois representations to geometric automorphic representations.

Contents: Lifting Automorphic Forms of PGSp(2) to PGL(4); Basic Facts; Trace Formulae; Lifting from SO(4) to PGL(4); Lifting from PGSp(2) to PGL(4); Fundamental Lemma; Zeta Functions of Shimura Varieties of PGSp(2); Automorphic Representations; Local Terms; Real Representations; Galois Representations; Background: On Automorphic Forms; On Artin’s Conjecture.

340pp Aug 2005
981-256-403-9 US$66 £38

MAA Online Book Review

“I recommend this book as a reference for teachers who need to find interesting examples that would motivate the study of Linear Algebra.”

Professor Heng Huat Chan
National University of Singapore

This short but rigorous book approaches the main ideas of linear algebra through carefully selected examples and relevant applications. It is intended for students with various interests in mathematics, as well as established scientists seeking to refresh their basic mathematical culture.

Key Features
• Includes some humorous sketches pinpointing key concepts
• Discusses infinite bases in a neat way via illuminating examples
• In an appendix on probability theory, linear independence and independence for random variables are compared

388pp Aug 2005
981-256-432-2 US$67 £39
981-256-499-3(pbk) US$36 £21

SELECTED PAPERS OF WANG YUAN
edited by Wang Yuan (Chinese Academy of Sciences, China)

This volume presents a comprehensive collection of Wang Yuan’s original important papers which are not available elsewhere, since the majority of the papers were published in China.

Covering both pure number theory and applied mathematics, this book is important for understanding Wang Yuan’s academic career and also the development of Chinese mathematics in recent years, since Wang Yuan’s work has a wide-ranging influence in China.

Wang Yuan is a professor and academician of the Chinese Academy of Sciences. He received his honorable Doctorship from Hong Kong Baptist University. He has published 70 papers and ten books.

Contents: Number Theory: On Some Properties of Integral Valued Polynomials; On Sieve Methods and Some of Their Applications; On the Estimation of Character Sum and Its Applications; Diophantine Inequalities for Forms in and Algebraic Number Field; Small Solutions of Congruences; Numerical Analysis and Statistics: A Note on Interpolation of a Certain Class of Functions; On Numerical Integration of Periodic Functions of Several Variables; A Note on Uniform Distribution and Experimental Design; Number Theoretic Method in Applied Statistics; Uniform Design of Experiments with Mixtures; and other papers.

512pp Jun 2005
981-256-197-8 US$105 £64
NONCOMMUTATIVE CHARACTER THEORY OF THE SYMMETRIC GROUP
by Dieter Blessenohl (Christian-Albrechts-Universität Kiel, Germany) & Manfred Schocker (University of Wales Swansea, UK)

A new approach to the character theory of the symmetric group has been developed during the past fifteen years which is in many ways more efficient, more transparent, and more elementary. In this approach, each permutation is assigned a class function of the corresponding symmetric group. Problems in character theory can thereby be transferred into a completely different setting and reduced to combinatorial problems on permutations in a natural and uniform way.

This is the first account in book form entirely devoted to the new “noncommutative method”. As a modern and comprehensive survey of the classical theory the book contains such fundamental results as the Murnaghan–Nakayama and Littlewood–Richardson rules as well as more recent applications in enumerative combinatorics and in the theory of the free Lie algebra. But it is also an introduction to the vibrant theory of certain combinatorial Hopf algebras such as the Malvenuto–Reutenauer algebra of permutations.

Key Features
- A new uniform and transparent approach at undergraduate level to character theory of the symmetric group
- First account of the material in book form
- Introduction to the Malvenuto–Reutenauer algebra of permutations and related combinatorial Hopf algebras
- A new detailed and complete treatment of the Robinson–Schensted correspondence including the results of Schützenberger, Knuth and Greene

184pp Jan 2005
1-86094-511-2 US$48 £29

FORMS OF FERMAT EQUATIONS AND THEIR ZETA FUNCTIONS
by Lars Brünjes (University of Regensburg, Germany)

In this volume, an abstract theory of ‘forms’ is developed, thus providing a conceptually satisfying framework for the classification of forms of Fermat equations. The classical results on diagonal forms are extended to the broader class of all forms of Fermat varieties.

The main topic is the study of forms of the Fermat equation over an arbitrary field \( K \). Using Galois descent, all such forms are classified; particularly, a complete and explicit classification of all cubic binary equations is given. If \( K \) is a finite field containing the \( d \)-th roots of unity, the Galois representation on the non-compact Lie group \( SL_d(\mathbb{R}) \). The book concludes with a chapter comparing the representations of the finite group \( SL_d(\mathbb{F}_p) \) and the non-compact Lie group \( SL_d(\mathbb{R}) \).

Key Features
- Detailed proofs with many diagrams
- Self-contained, assuming only basic knowledge of commutative algebra and algebraic geometry, including needed facts on \( p \)-adic cohomology and varieties over finite fields
- Application of modern theory \( (p \)-adic cohomology) to a ‘down-to-earth’ problem (counting solutions of equations), thereby combining the abstract with the concrete and demonstrating how to use the machinery of modern arithmetic geometry to answer elementary questions

248pp Oct 2004
981-256-039-4 US$60 £37

REPRESENTATIONS OF FINITE AND LIE GROUPS
by Charles B Thomas (University of Cambridge, UK)

This book provides an introduction to representations of both finite and compact groups. The proofs of the basic results are given for the finite case, but are so phrased as to hold without change for compact topological groups with an invariant integral replacing the sum over the group elements as an averaging tool. Among the topics covered are the relation between representations and characters, the construction of irreducible representations, induced representations and Frobenius reciprocity. Special emphasis is given to exterior powers, with the symmetric group \( S_n \) as an illustrative example. The book concludes with a chapter comparing the representations of the finite group \( SL_2(\mathbb{F}_p) \) and the non-compact Lie group \( SL_2(\mathbb{R}) \).

Contents: Basic Representation Theory-I; Induced Representations and Their Characters; Multilinear Algebra and \( l \)-rings; Representations of Compact Groups; Lie Groups and Algebras; \( SL_2(\mathbb{F}_p) \) and \( SL_2(\mathbb{R}) \).

156pp Oct 2004
1-86094-482-5 US$48 £29
1-86094-484-1(pbk) US$28 £17

ANALYTIC NUMBER THEORY
An Introductory Course
by Paul T Bateman & Harold G Diamond (University of Illinois at Urbana-Champaign)

“This book also includes a nice introduction to sieve methods … Overall, this is a nice well-written book with plenty of material for a one-year graduate course. It would also make nice supplementary reading for a student or researcher learning the subject.”

MAA Online Book Review

“This is a nice introductory book on analytic number theory for students or readers with some background in real analysis, complex analysis, number theory and abstract algebra … There are various exercises throughout the entire book. Moreover, at the end of each chapter, historical backgrounds and developments of each particular subject or theorem are given together with references.”

Mathematical Reviews

This valuable book focuses on a collection of powerful methods of analysis that yield deep number-theoretical estimates. Particular attention is given to counting functions of prime numbers and multiplicative arithmetic functions. Both real variable (“elementary”) and complex variable (“analytic”) methods are employed.

276pp Sept 2004
981-238-938-5 US$78 £48
981-256-080-7(pbk) US$42 £26
“Both challenging and provocative reading, Doing Mathematics sheds bright light on some of the main characteristics of the mathematical quest.”

Library of Science

“Krieger has made some effort to accommodate different levels of readers, for example structuring his text so that lay readers are alerted to sections that can be safely skipped and paragraphs that provide nontechnical summaries.”

Mathematical Association of America

“This is the first time I have seen a mathematician deal substantively with the issue of mathematics as culturally based, and he does it superbly and mathematically … Although this book is no easy read, it is well worth the effort, and I am sure it will stimulate and inform, perhaps even surprise, the most sophisticated of mathematical readers. It is refreshing to find such a book being published.”

T T Wu
Gordon McKay Professor of Applied Physics & Professor of Physics

This book discusses some ways of doing mathematical work and the subject matter that is being worked upon and created. It argues that the conventions we adopt, the subject areas we delimit, what we can prove and calculate about the physical world, and the analogies that work for mathematicians — all depend on mathematics, what will work out and what won’t. And the mathematics, as it is done, is shaped and supported, or not, by convention, subject matter, calculation, and analogy. The cases studied include the central limit theorem of statistics, the sound of the shape of a drum, the connection between algebra and topology, the stability of matter, the Ising model, and the Langlands Program in number theory and representation theory.

Contents:

472pp  Jan 2003
981-238-200-3  US$84  £57
981-238-206-2(pbk)  US$38  £26

About the Author

Martin Krieger has taught at the University of California (Berkeley), the University of Minnesota (Twin Cities), MIT, and the University of Michigan (Ann Arbor). He has been a fellow at the Center for Advanced Study in the Behavioral Sciences and at the National Humanities Center. He is professor of planning at the University of Southern California. Professor Krieger was trained as physicist.


Doing Mathematics is a Library of Science selection.
AN INTRODUCTION TO COMMUTATIVE ALGEBRA
From the Viewpoint of Normalization
by Huishi Li (Jiaying University, China)

“The text comes complete with useful examples and exercises ... the student will appreciate this enthusiastic account of core classical topics at the heart of commutative algebra.”

Mathematical Reviews

Designed for a one-semester course in mathematics, this textbook presents a concise and practical introduction to commutative algebra in terms of normal (normalized) structure. It shows how the nature of commutative algebra has been used by both number theory and algebraic geometry. Many worked examples and a number of problem (with hints) can be found in the volume. It is also a convenient reference for researchers who use basic commutative algebra.

Contents: Local Rings, DVRs, and Localization; Integral Extensions and Normalization; The Ring $\mathbb{A}_K$ in $K = \mathbb{Q}(\mu)$; Algebraic Geometry.

188pp  Aug 2004
981-238-951-2  US$46  £28

FUNCTION FIELD ARITHMETIC
by Dinesh S Thakur (University of Arizona, USA)

“It is dense with mathematics, but there is also motivation and discussion. The overall feeling is that of a very helpful survey of a very interesting field.”

MAA Online Book Review

“Thakur’s book is a welcome addition to the collection of books on the arithmetic of Drinfeld modules and objects related to them. Written by an expert in the field, the book’s style is generally informal, without compromising rigor. It certainly will be useful to graduate students wishing to pursue research in the area of function fields, and at the same time it can be used as a reference book. Many of the important results on special values and transcendence are due to Thakur himself, so in many places the reader gets the ‘insider’s look’ on the subject, and sees how the ideas which go into the proofs were gradually developed.”

Mathematical Reviews

“Thakur’s book is a valuable contribution to the theory of arithmetic function fields … The author has included several interesting examples and discusses many open problems.”

Zentralblatt MATH

Contents: Number Fields and Function Fields; Drinfeld Modules; Explicit Class Field Theory; Gauss Sums and Gamma Functions; Zeta Functions; Higher Rank Theory; Higher Dimensions and Geometric Tools; Applications to Gauss Sums, Gamma and Zeta Values; Diophantine Approximation; Transcendence Results; Automata and Algebraicity; Applications.

404pp  Jun 2004
981-238-839-7  US$92  £56

JOURNAL OF ALGEBRA AND APPLICATIONS (JAA)

www.worldscinet.com/jaa/jaa.shtml

Executive Editors
S K Jain (Ohio University, Athens)
S R López-Permouth (Ohio University, Athens)

Top Accessed Articles
Valuations Of $K((x_1,...,x_n))$ With Preassigned Group Of Values
A. Granja (University of León, Spain)

On The Ranks Of The Conway Groups Co2 And Co3
Faryad Ali & Mohammed Ali Faya Ibrahim (King Khalid University, Saudi Arabia)

Antisymmetric Elements In Group Rings
Eric Jespers (Vrije Universiteit Brussel, Belgium) &
Manuel Ruiz Marin (Universidad Politécnica de Cartagena, Spain)

A Generalization Of Semisimple Artinian Rings
Yasuyuki Hirano (Okayama University, Japan) & Hisaya Tsutsui
(Millersville University of Pennsylvania, USA)

Simple Regular Skew Group Rings
Kathi Crow (Gettysburg College, USA)
GROUPS, RINGS AND GALOIS THEORY
Second Edition
by Victor P Snaith (University of Southampton, UK)

"Certainly, this enlarged second edition of a great primer of abstract algebra has increased its degree of efficiency, in particular in its capacity as an algebraic source for both studying and teaching elementary algebraic number theory. Moreover, this text is and remains a perfect background for the further study of algebra at its more advanced level, and in all its different directions, perhaps so by means of one of the many comprehensive standard books in the field."

Zentralblatt MATH

This book is ideally suited for a two-term undergraduate algebra course culminating in a discussion on Galois theory. It provides an introduction to group theory and ring theory en route. In addition, there is a chapter on groups — including applications to error-correcting codes and to solving Rubik's cube. The concise style of the book will facilitate student-instructor discussion, as will the selection of exercises with various levels of difficulty. For the second edition, two chapters on modules over principal ideal domains and Dedekind domains have been added, which are suitable for an advanced undergraduate reading course or a first-year graduate course.

Contents: Group Theory; Ring Theory; Galois Theory; Rings and Modules; Dedekind Domains.

228pp Oct 2003
981-238-576-2 US$66 £49
981-238-600-9(pbk) US$34 £25

LECTURES ON FINITE FIELDS AND GALOIS RINGS
by Zhe-Xian Wan (Chinese Academy of Sciences, China)

"This is a thorough treatment of the theory of finite fields and Galois rings, the bulk of the text being devoted to the former ... The book is well written."

Mathematical Reviews

This is a textbook for graduate and upper level undergraduate students in mathematics, computer science, communication engineering and other fields. The explicit construction of finite fields and the computation in finite fields are emphasised. In particular, the construction of irreducible polynomials and the normal basis of finite fields are included. The essentials of Galois rings are also presented. This invaluable book has been written in a friendly style, so that lecturers can easily use it as a text and students can use it for self-study. A great number of exercises have been incorporated.

Contents: Sets and Integers; Groups; Fields and Rings; Polynomials; Residue Class Rings; Structure of Finite Fields; Further Properties of Finite Fields; Bases; Factoring Polynomials over Finite Fields; Irreducible Polynomials over Finite Fields; Quadratic Forms over Finite Fields; More Group Theory and Ring Theory; Hensel's Lemma and Hensel Lift; Galois Rings.

352pp Aug 2003
981-238-504-5 US$68 £50
981-238-570-3(pbk) US$38 £28

ALGEBRAIC COMBINATORICS AND QUANTUM GROUPS
edited by Naihuan Jing (North Carolina State University, USA)

Algebraic combinatorics has evolved into one of the most active areas of mathematics during the last several decades. Its recent developments have become more interactive with not only its traditional field representation theory but also algebraic geometry, harmonic analysis and mathematical physics.

This book presents articles from some of the key contributors in the area. It covers Hecke algebras, Hall algebras, the Macdonald polynomial and its deviations, and their relations with other fields.

Contents: Uno’s Conjecture on Representation Types of Hecke Algebras (S Ariki); Quiver Varieties, Aline Lie Algebras, Algebras of BPS States, and Semiclassical Basis (I Frenkel et al.); Divided Differences of Type D and the Grassmannian of Complex Structures (H Duan & P Pragacz); Tableaux Statistics For Two Part Macdonald Polynomials (L Lapointe & J Morse); A Crystal to Rigged Configuration Bijection for Nonexceptional Affine Algebras (M Okado et al.); Littlewood’s Formulas for Characters of Orthogonal and Symplectic Groups (A Laszoux); A q-Analog of Schur’s Q-Functions (G Tudose & M Zabrocki).

172pp Jul 2003
981-238-446-4 US$31 £23

COMPLETELY POSITIVE MATRICES
by Abraham Berman (Technion – Israel Institute of Technology) & Naomi Shaked-Monderer (Emek Yezeitel College, Israel)

"Overall, this appears to be a highly delightful book to read, study, and teach from."

Zentralblatt MATH

"The topics are of interest mainly from an applied mathematician’s point of view, but the techniques and the difficulties make them appealing for the pure mathematician as well."

Mathematical Reviews

A real matrix is positive semidefinite if it can be decomposed as A=BB’. In some applications the matrix B has to be elementwise nonnegative. If such a matrix exists, A is called completely positive. The smallest number of columns of a nonnegative matrix B such that A=BB’ is known as the cp-rank of A.

This invaluable book focuses on necessary conditions and sufficient conditions for complete positivity, as well as bounds for the cp-rank. The methods are combinatorial, geometric and algebraic. The required background on nonnegative matrices, cones, graphs and Schur complements is outlined.

Contents: Preliminaries: Matrix Theoretic Background; Positive Semidefinite Matrices; Nonnegative Matrices and M-Matrices; Schur Complements; Graphs; Convex Cones; The PSD Completion Problem; Complete Positivity: Definition and Basic Properties; Cones of Completely Positive Matrices; Small Matrices; Complete Positivity and the Comparison Matrix; Completely Positive Graphs; Completely Positive Matrices Whose Graphs are Not Completely Positive; Square Factorizations; Functions of Completely Positive Matrices; The CP Completion Problem; CP Rank: Definition and Basic Results; Completely Positive Matrices of a Given Rank; Completely Positive Matrices of a Given Order; When is the CP-Rank Equal to the Rank?

216pp Apr 2003
981-238-368-9 US$46 £34
GROUPS, COMBINATORICS AND GEOMETRY
DURHAM 2001
Durham, UK 16 – 26 July 2001
edited by A A Ivanov, M W Liebeck (Imperial College of Science, Technology and Medicine, UK) & J Saxl (University of Cambridge, UK)

Over the past 20 years, the theory of groups — in particular simple groups, finite and algebraic — has influenced a number of diverse areas of mathematics. Such areas include topics where groups have been traditionally applied, such as algebraic combinatorics, finite geometries, Galois theory and permutation groups, as well as several more recent developments. Among the latter are probabilistic and computational group theory, the theory of algebraic groups over number fields, and model theory, in each of which there has been a major recent impetus provided by simple group theory. In addition, there is still great interest in local analysis in finite groups, with substantial new input from methods of geometry and amalgams, and particular emphasis on the revision project for the classification of finite simple groups.

This important book contains 20 survey articles covering many of the above developments. It should prove invaluable for those working in the theory of groups and its applications.

Contents: Curtis–Phan–Tits Theory (C D Bennett et al.); Derangements in Simple and Primitive Groups (J Fulman & R Guralnick); Computing with Matrix Groups (W M Kantor & Á Seress); Bases of Primitive Permutation Groups (M W Liebeck & A Shalev); Modular Subgroup Arithmetic (T W Müller); Counting Nets in the Monster (S P Norton); Overgroups of Finite Quasiprimitive Permutation Groups (C E Praeger); Old Groups Can Learn New Tricks (L Pyber): Structure and Presentations of Lie-Type Groups (F G Timmesfeld); Computing in the Monster (R A Wilson); and other papers.

348pp Mar 2003
981-238-312-3 US$96 £71

ULTRAMETRIC BANACH ALGEBRAS
by Alain Escassut (Université Blaise Pascal, France)

“... in this book techniques based on affinoid algebras and ultrametric Banach algebras are in great measure considered together, which is something that cannot be seen in any other book. For this reason the book fills a gap which had existed in the literature.”

Mathematical Reviews

“The author is a well known specialist in the field and the book is largely based on his original results. It will be of interest to researchers in non-archimedean analysis.”

Studia Universitatis Babes-Bolyai, Series Mathematica

In this book, ultrametric Banach algebras are studied with the help of topological considerations, properties from affinoid algebras, and circular filters which characterize absolute values on polynomials and make a nice tree structure. The Shilov boundary does exist for normed ultrametric algebras.

Contents: Tree Structure; Ultrametric Absolute Values; Hensel Lemma; Circular Filters; Analytic Elements; Holomorphic Properties on Infraconnected Sets; Analytic Elements on Classic Partitions; Holomorphic Functional Calculus; Definition of Affinoid Algebras; Jacobson Radical of Affinoid Algebras; Separable Fields; Krasner–Tate Algebras; Universal Generators in Tate Algebras; Associated Idempotents; and other topics.

292pp Mar 2003
981-238-194-5 US$65 £48

INTERNATIONAL JOURNAL OF ALGEBRA AND COMPUTATION (IJAC)

Managing Editors
S W Margolis (Bar Ilan University, Israel)
J Meakin (University of Nebraska-Lincoln, USA)

Top Accessed Articles

Profinite Topologies In Free Products Of Groups
Luis Ribes (Carleton University, Canada) & Pavel Zalesskii (Universidade de Brasilia, Brazil)

Abstract
Let C be a nonempty class of finite groups closed under taking subgroups, quotients and extensions. We consider groups G endowed with their pro-C topology, and say that G is 2-subgroup separable if whenever H and K are finitely generated closed subgroups of G, then the subset HK is closed. We prove that if the groups G1 and G2 are 2-subgroup separable, then so is their free product G1*G2. This extends a result to T. Coulbois. The proof uses actions of groups on abstract and profinite trees.

Universal Cellular Automaton Over A Hexagonal Tiling With 3 States
A. Gajardo & E. Goles (Universidad de Chile, Chile)

Abstract
A universal three-state three-neighbor cellular automaton will be constructed. The space selected for this cellular automaton is a hexagonal tiling where the cells are in the vertices and the neighbors are the three nearest cells. We define the local transition rule as well as the basic elements that will aid to build digital circuits and, by the way, prove the universality of this cellular automaton. The local transition rule is defined to be isotropic.

Unavoidable And Almost Unavoidable Sets Of Words
Jason P. Bell (Simon Fraser University, Canada)

Abstract
A set of words over a finite alphabet is called an unavoidable set if every word of sufficiently long length must contain some word from this set as a subword. Motivated by a theorem from automata theory, we introduce the notion of an almost unavoidable set and prove certain asymptotic estimates for the size of almost unavoidable sets of uniform length.
GALOIS’ THEORY OF ALGEBRAIC EQUATIONS
by Jean-Pierre Tignol (Université Catholique de Louvain, Belgium)

“Generally speaking, mathematics teaching nowadays has a problem with history … Tignol finds just the right balance between the extremes of a historical exposition and philological reconstruction. Tignol lets both the triumphs and limitations of the past illuminate our modern understanding.”

Choice

“… it is indeed a methodological masterpiece within the vast existing literature on this subject … this work is a very welcome addition to the ample literature on classical Galois theory, especially so from the viewpoints of culture, history, and methodology in mathematical science. The author has done a great service to the entire mathematical community.”

Mathematics Abstracts

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Galois’ Theory of Algebraic Equations gives a detailed account of the development of the theory of algebraic equations, from its origins in ancient times to its completion by Galois in the nineteenth century. The main emphasis is placed on equations of at least the third degree, i.e. on the developments during the period from the sixteenth to the nineteenth century. The appropriate parts of works by Cardano, Lagrange, Vandermonde, Gauss, Abel and Galois are reviewed and placed in their historical perspective, with the aim of conveying to the reader a sense of the way in which the theory of algebraic equations has evolved and has led to such basic mathematical notions as “group” and “field”. A brief discussion on the fundamental theorems of modern Galois theory is included. Complete proofs of the quoted results are provided, but the material has been organized in such a way that the most technical details can be skipped by readers who are interested primarily in a broad survey of the theory.

This book will appeal to both undergraduate and graduate students in mathematics and the history of science, and also to teachers and mathematicians who wish to obtain a historical perspective of the field. The text has been designed to be self-contained, but some familiarity with basic mathematical structures and with some elementary notions of linear algebra is desirable for a good understanding of the technical discussions in the later chapters.

Contents: Quadratic Equations; Cubic Equations; Quartic Equations; The Creation of Polynomials; A Modern Approach to Polynomials; Alternative Methods for Cubic and Quartic Equations; Roots of Unity; Symmetric Functions; The Fundamental Theorem of Algebra; Lagrange; Vandermonde; Gauss on Cyclotomic Equations; Ruffini and Abel on General Equations; Galois.

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Mathematical Reviews

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