Algebra With Galois Theory American Mathematical Society

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Advanced Modern Algebra: Third Edition, Part 2 - Joseph J. Rotman 2017-08-15
This book is the second part of the new edition of Advanced Modern Algebra (the first part published as Graduate Studies in Mathematics, Volume 165). Compared to the previous edition, the material has been significantly reorganized and many sections have been rewritten. The book presents many topics mentioned in the first part in greater depth and in more detail. The five chapters of the book are devoted to group theory, representation theory, homological algebra, categories, and commutative algebra, respectively. The book can be used as a text for a second abstract algebra graduate course, as a source of additional material to a first abstract algebra graduate course, or for self-study.
Abstract Algebra - Ronald Solomon 2009
This undergraduate text takes a novel approach to the standard introductory material on groups, rings, and fields. At the heart of the text is a semi-historical journey through the early decades of the subject as it emerged in the revolutionary work of Euler, Lagrange, Gauss, and Galois. Avoiding excessive abstraction whenever possible, the text focuses on the central problem of studying the solutions of polynomial equations. Highlights include a proof of the Fundamental Theorem of Algebra, essentially due to Euler, and a proof of the constructability of the regular 17-gon, in the manner of Gauss. Another novel feature is the introduction of groups through a meditation on the meaning of congruence in the work of Euclid. Everywhere in the text, the goal is to make clear the links connecting abstract algebra to Euclidean geometry, high school algebra, and trigonometry, in the hope that students pursuing a career as secondary mathematics educators will carry away a deeper and richer understanding of the high school mathematics curriculum. Another goal is to encourage students, insofar as possible in a textbook format, to build the course for themselves, with exercises integrally embedded in the text of each chapter.
Selected Works of Ellis Kolchin with Commentary - Ellis Robert Kolchin 1999
The work of Joseph Fels Ritt and Ellis Kolchin in differential algebra paved the way for exciting new applications in constructive symbolic computation, differential Galois theory, the model theory of fields, and Diophantine geometry. This volume assembles Kolchin's mathematical papers, contributing solidly to the archive on construction of modern differential algebra. This collection of Kolchin's clear and comprehensive papers--in themselves constituting a history of the subject--is an invaluable aid to the student of differential algebra. In 1910, Ritt created a theory of algebraic differential equations modeled not on the existing transcendental methods of Lie, but rather on the new algebra being developed by E. Noether and B. van der Waerden. Building on Ritt's foundation, and deeply influenced by Weil and Chevalley, Kolchin opened up Ritt theory to modern algebraic geometry. In so doing, he led differential geometry in a new direction. By creating differential algebraic geometry and the theory of differential algebraic groups, Kolchin provided the foundation for a "new geometry" that has led to both a striking and an original approach to arithmetic algebraic geometry. Intriguing possibilities were introduced for a new language for nonlinear differential equations theory. The volume includes commentary by A. Borel, M. Singer, and B. Poizat. Also Buium and Cassidy trace the development of Kolchin's ideas, from his important early work on the differential Galois theory to his later groundbreaking results on the theory of differential algebraic geometry and differential algebraic groups. Commentaries are self-contained with numerous examples of various aspects of differential algebra and its applications. Central topics of Kolchin's work are discussed, presenting the history of differential algebra and exploring how his work grew from and transformed the work of Ritt. New directions of differential algebra are illustrated, outlining important current advances. Prerequisite to understanding the text is a background at the beginning graduate level in algebra, specifically commutative algebra, the theory of field extensions, and Galois theory.
Galois Theory for Beginners - Jörg Bewersdorff 2006
Galois theory is the culmination of a centuries-long search for a solution to the classical problem of solving algebraic equations by radicals. This book follows the historical development of the theory, emphasizing concrete examples along the way. It is suitable for undergraduates and beginning graduate students.
Galois Theory, Hopf Algebras, and Semiabelian Categories - George Janelidze 2004
This volume is based on talks given at the Workshop on Categorical Structures for Descent and Galois Theory, Hopf Algebras, and Semiabelian Categories held at The Fields Institute for Research in Mathematical Sciences (Toronto, ON, Canada). The meeting brought together researchers working in these interrelated areas. This collection of survey and research papers gives an up-to-date account of the many current connections among Galois theories, Hopf algebras, and semiabeliancategories. The book features articles by leading researchers on a wide range of themes, specifically, abstract Galois theory, Hopf algebras, and categorical structures, in particular quantum categories and higher-dimensional structures. Articles are suitable for graduate students and researchers,specifically those interested in Galois theory and Hopf algebras and their categorical unification.
A Tour of Representation Theory - Martin Lorenz 2018
Representation theory investigates the different ways in which a given algebraic object--such as a group or a Lie algebra--can act on a vector space. Besides being a subject of great intrinsic beauty, the theory enjoys the additional benefit of having applications in myriad contexts outside pure mathematics, including quantum field theory and the study of molecules in chemistry. Adopting a panoramic viewpoint, this book offers an introduction to four different flavors of representation theory: representations of algebras, groups, Lie algebras, and Hopf algebras. A separate part of the book is devoted to each of these areas and they are all treated in sufficient depth to enable and hopefully entice the reader to pursue research in representation theory. The book is intended as a textbook for a course on representation theory, which could immediately follow the standard graduate abstract algebra course, and for subsequent more advanced reading courses. Therefore, more than 350 exercises at various levels of difficulty are included. The broad range of topics covered will also make the text a valuable reference for researchers in algebra and related areas and a source for graduate and postgraduate students wishing to learn more about representation theory by self-study.
Galois Theory of Linear Differential Equations - Marius van der Put 2012-12-06

From the reviews: "This is a great book, which will hopefully become a classic in the subject of differential Galois theory. [...] the specialist, as well as the novice, have long been missing an introductory book covering also specific and advanced research topics. This gap is filled by the volume under review, and more than satisfactorily." Mathematical Reviews

Visual Group Theory - Nathan Carter 2021-06-08

Recipient of the Mathematical Association of America's Beckenbach Book Prize in 2012! Group theory is the branch of mathematics that studies symmetry, found in crystals, art, architecture, music and many other contexts, but its beauty is lost on students when it is taught in a technical style that is difficult to understand. Visual Group Theory assumes only a high school mathematics background and covers a typical undergraduate course in group theory from a thoroughly visual perspective. The more than 300 illustrations in Visual Group Theory bring groups, subgroups, homomorphisms, products, and quotients into clear view. Every topic and theorem is accompanied with a visual demonstration of its meaning and import, from the basics of groups and subgroups through advanced structural concepts such as semidirect products and Sylow theory.

Galois Extensions of Structured Ring Spectra/Stably Dualizable Groups - John Rognes 2008

The author introduces the notion of a Galois extension of commutative S-algebras (E_∞ ring spectra), often localized with respect to a fixed homology theory. There are numerous examples, including some involving Eilenberg-Mac Lane spectra of commutative rings, real and complex topological K-theory, Lubin-Tate spectra and cochain S-algebras. He establishes the main theorem of Galois theory in this generality. Its proof involves the notions of separable and etale extensions of commutative S-algebras, and the Goerss-Hopkins-Miller theory for E_∞ mapping spaces. He shows that the global sphere spectrum S is separably closed, using Minkowski's discriminant theorem, and he estimates the separable closure of its localization with respect to each of the Morava K-theories. He also defines Hopf-Galois extensions of commutative S-algebras and studies the complex cobordism spectrum MU as a common integral model for all of the local Lubin-Tate Galois extensions. The author extends the duality theory for topological groups from the classical theory for compact Lie groups, via the topological study by J. R. Klein and the p-complete study for p-compact groups by T. Bauer, to a general duality theory for stably dualizable groups in the E-local stable homotopy category, for any spectrum E.

Essays in the History of Lie Groups and Algebraic Groups - Armand Borel 2001

Algebraic groups and Lie groups are important in most major areas of mathematics, occuring in diverse roles such as the symmetries of differential equations and as central figures in the Langlands program for number theory. In this book, Professor Borel looks at the development of the theory of Lie groups and algebraic groups, highlighting the evolution from the almost purely local theory at the start to the global theory that we know today. As the starting point of this passagefrom local to global, the author takes Lie's theory of local analytic transformation groups and Lie algebras. He then follows the globalization of the process in its two most important frameworks: (transcendental) differential geometry and algebraic geometry. Chapters II to IV are devoted to the former,Chapters V to VIII, to the latter.The essays in the first part of the book survey various proofs of the full reducibility of linear representations of $SL 2M$, the contributions H. Weyl to representation and invariant theory for Lie groups, and conclude with a chapter on E. Cartan's theory of symmetric spaces and Lie groups in the large.The second part of the book starts with Chapter V describing the development of the theory of linear algebraic groups in the 19th century. Many of the main contributions here are due to E. Study, E. Cartan, and above all, to L. Maurer. After being abandoned for nearly 50 years, the theory was revived by Chevalley and Kolchin and then further developed by many others. This is the focus of Chapter VI. The book concludes with two chapters on various aspects of the works of Chevalley on Lie groupsand algebraic groups and Kolchin on algebraic groups and the Galois theory of differential fields.The author brings a unique perspective to this study. As an important developer of some of the modern elements of both the differential geometric and the algebraic geometric sides of the theory, he has a particularly deep appreciation of the underlying mathematics. His lifelong involvement and his historical research in the subject give him a special appreciation of the story of its development.

A History of Abstract Algebra - Jeremy Gray 2018-08-07

This textbook provides an accessible account of the history of abstract algebra, tracing a range of topics in modern algebra and number theory back to their modest presence in the seventeenth and eighteenth centuries, and exploring the impact of ideas on the development of the subject. Beginning with Gauss’s theory of numbers and Galois’s ideas, the book progresses to Dedekind and Kronecker, Jordan and Klein, Steinitz, Hilbert, and Emmy Noether. Approaching mathematical topics from a historical perspective, the author explores quadratic forms, quadratic reciprocity, Fermat’s Last Theorem, cyclotomy, quintic equations, Galois theory, commutative rings, abstract fields, ideal theory, invariant theory, and group theory. Readers will learn what Galois accomplished, how difficult the proofs of his theorems were, and how important Camille Jordan and Felix Klein were in the eventual acceptance of Galois’s approach to the solution of equations. The book also describes the relationship between Kummer’s ideal numbers and Dedekind’s ideals, and discusses why Dedekind felt his solution to the divisor problem was better than Kummer’s. Designed for a course in the history of modern algebra, this book is aimed at undergraduate students with an introductory background in algebra but will also appeal to researchers with a general interest in the topic. With exercises at the end of each chapter and appendices providing material difficult to find elsewhere, this book is self-contained and therefore suitable for self-study.

Algebraic Number Fields - Gerald J. Janusz 1996

This text presents the basic information about finite dimensional extension fields of the rational numbers, algebraic number fields, and the rings of algebraic integers in them. The important theorems regarding the units of the ring of integers and the class group are proved and illustrated with many examples given in detail. The completion of an algebraic number field at a valuation is discussed in detail and then used to provide economical proofs of global results. The book contains many concrete examples illustrating the computation of class groups, class numbers, and Hilbert class fields. Exercises are provided to indicate applications of the general theory.

Vertex Algebras for Beginners - Victor G. Kac 1998

Based on courses given by the author at MIT and at Rome University in spring 1997, this book presents an introduction to algebraic aspects of conformal field theory. It includes material on the foundations of a rapidly growing area of algebraic conformal theory.

Lectures on Differential Galois Theory - Andy R. Magid 1994

Differential Galois theory studies solutions of differential equations over a differential base field. In much the same way that ordinary Galois theory is the theory of field extensions generated by solutions of (one variable) polynomial equations, differential Galois theory looks at the nature of the differential field extension generated by the solutions of differential equations. An additional feature is that the corresponding differential Galois groups (of automorphisms of the extension fixing the base and commuting with the derivation) are algebraic groups. This book deals with the differential Galois theory of linear homogeneous differential equations, whose differential Galois groups are algebraic matrix groups.In addition to providing a convenient path to Galois theory, this approach also leads to the constructive solution of the inverse problem of differential Galois theory for various classes of algebraic groups. Providing a self-contained development and many explicit examples, this book provides a unique approach to differential Galois theory and is suitable as a textbook at the advanced graduate level.

Galois Theory, Rings, Algebraic Groups and Their Applications - Simeon Ivanov 1992

This collection consists of original work on Galois theory, rings and algebras, algebraic

geometry, group representations, algebraic K—theory and some of their applications.
Intrinsic Approach to Galois Theory of q-Difference Equations - Lucia Di Vizio 2022-08-31
View the abstract.
Learning Modern Algebra - Al Cuoco 2013
Learning Modern Algebra aligns with the CBMS Mathematical Education of Teachers–II recommendations, in both content and practice. It emphasizes rings and fields over groups, and it makes explicit connections between the ideas of abstract algebra and the mathematics used by high school teachers. It provides opportunities for prospective and practicing teachers to experience mathematics for themselves, before the formalities are developed, and it is explicit about the mathematical habits of mind that lie beneath the definitions and theorems.This book is designed for prospective and practicing high school mathematics teachers, but it can serve as a text for standard abstract algebra courses as well. The presentation is organized historically: the Babylonians introduced Pythagorean triples to teach the Pythagorean theorem; these were classified by Diophantus, and eventually this led Fermat to conjecture his Last Theorem. The text shows how much of modern algebra arose in attempts to prove this; it also shows how other important themes in algebra arose from questions related to teaching. Indeed, modern algebra is a very useful tool for teachers, with deep connections to the actual content of high school mathematics, as well as to the mathematics teachers use in their profession that doesn't necessarily “end up on the blackboard." The focus is on number theory, polynomials, and commutative rings. Group theory is introduced near the end of the text to explain why generalizations of the quadratic formula do not exist for polynomials of high degree, allowing the reader to appreciate the more general work of Galois and Abel on roots of polynomials. Results and proofs are motivated with specific examples whenever possible, so that abstractions emerge from concrete experience. Applications range from the theory of repeating decimals to the use of imaginary quadratic fields to construct problems with rational solutions. While such applications are integrated throughout, each chapter also contains a section giving explicit connections between the content of the chapter and high school teaching.
Thinking Algebraically: An Introduction to Abstract Algebra - Thomas Q. Sibley 2021-06-08
Thinking Algebraically presents the insights of abstract algebra in a welcoming and accessible way. It succeeds in combining the advantages of rings-first and groups-first approaches while avoiding the disadvantages. After an historical overview, the first chapter studies familiar examples and elementary properties of groups and rings simultaneously to motivate the modern understanding of algebra. The text builds intuition for abstract algebra starting from high school algebra. In addition to the standard number systems, polynomials, vectors, and matrices, the first chapter introduces modular arithmetic and dihedral groups. The second chapter builds on these basic examples and properties, enabling students to learn structural ideas common to rings and groups: isomorphism, homomorphism, and direct product. The third chapter investigates introductory group theory. Later chapters delve more deeply into groups, rings, and fields, including Galois theory, and they also introduce other topics, such as lattices. The exposition is clear and conversational throughout. The book has numerous exercises in each section as well as supplemental exercises and projects for each chapter. Many examples and well over 100 figures provide support for learning. Short biographies introduce the mathematicians who proved many of the results. The book presents a pathway to algebraic thinking in a semester- or year-long algebra course.
Galois Theory - Emil Artin 2012-05-24
Clearly presented discussions of fields, vector spaces, homogeneous linear equations, extension fields, polynomials, algebraic elements, as well as sections on solvable groups, permutation groups, solution of equations by radicals, and other concepts. 1966 edition.
Algebra - I. Martin Isaacs 2009
as a student." --Book Jacket.
Algebra and Tiling - Sherman Stein 1994
A concise investigation into the connections between tiling space problems and algebraic ideas, suitable for undergraduates.
Differential Galois Theory through Riemann-Hilbert Correspondence - Jacques Sauloy 2016-12-07
Differential Galois theory is an important, fast developing area which appears more and more in graduate courses since it mixes fundamental objects from many different areas of mathematics in a stimulating context. For a long time, the dominant approach, usually called Picard-Vessiot Theory, was purely algebraic. This approach has been extensively developed and is well covered in the literature. An alternative approach consists in tagging algebraic objects with transcendental information which enriches the understanding and brings not only new points of view but also new solutions. It is very powerful and can be applied in situations where the Picard-Vessiot approach is not easily extended. This book offers a hands-on transcendental approach to differential Galois theory, based on the Riemann-Hilbert correspondence. Along the way, it provides a smooth, down-to-earth introduction to algebraic geometry, category theory and tannakian duality. Since the book studies only complex analytic linear differential equations, the main prerequisites are complex function theory, linear algebra, and an elementary knowledge of groups and of polynomials in many variables. A large variety of examples, exercises, and theoretical constructions, often via explicit computations, offers first-year graduate students an accessible entry into this exciting area.
Rings, Extensions, and Cohomology - Andy R. Magid 2020-09-10
"Presenting the proceedings of a conference held recently at Northwestern University, Evanston, Illinois, on the occasion of the retirement of noted mathematician Daniel Zelinsky, this novel reference provides up-to-date coverage of topics in commutative and noncommutative ring extensions, especially those involving issues of separability, Galois theory, and cohomology."
Galois Theory and Cohomology of Commutative Rings - Stephen Urban Chase 1969
Hopf Algebras and Galois Module Theory - Lindsay N. Childs 2021-11-10
Hopf algebras have been shown to play a natural role in studying questions of integral module structure in extensions of local or global fields. This book surveys the state of the art in Hopf-Galois theory and Hopf-Galois module theory and can be viewed as a sequel to the first author's book, Taming Wild Extensions: Hopf Algebras and Local Galois Module Theory, which was published in 2000. The book is divided into two parts. Part I is more algebraic and focuses on Hopf-Galois structures on Galois field extensions, as well as the connection between this topic and the theory of skew braces. Part II is more number theoretical and studies the application of Hopf algebras to questions of integral module structure in extensions of local or global fields. Graduate students and researchers with a general background in graduate-level algebra, algebraic number theory, and some familiarity with Hopf algebras will appreciate the overview of the current state of this exciting area and the suggestions for numerous avenues for further research and investigation.
An Extension of the Galois Theory of Grothendieck - André Joyal 1984

Factorization Algebras in Quantum Field Theory - Kevin Costello 2021-09-23
This second volume shows how factorization algebras arise from interacting field theories, both classical and quantum.
Exposition by Emil Artin: A Selection - Emil Artin 2007
Emil Artin was one of the great mathematicians of the twentieth century. He had the rare distinction of having solved two of the famous problems posed by David Hilbert in 1900. He showed that every positive definite rational function of several variables was a sum of squares. He also discovered and proved the Artin reciprocity law, the culmination of over a century and a half of progress in algebraic number theory. Artin had a great influence on the development of mathematics in his time, both by means of his many contributions to research and by the high

level and excellence of his teaching and expository writing. In this volume we gather together in one place a selection of his writings wherein the reader can learn some beautiful mathematics as seen through the eyes of a true master. The volume's Introduction provides a short biographical sketch of Emil Artin, followed by an introduction to the books and papers included in the volume. The reader will first find three of Artin's short books, titled The Gamma Function, Galois Theory, and Theory of Algebraic Numbers, respectively. These are followed by papers on algebra, algebraic number theory, real fields, braid groups, and complex and functional analysis. The three papers on real fields have been translated into English for the first time. The flavor of these works is best captured by the following quote of Richard Brauer. ``There are a number of books and sets of lecture notes by Emil Artin. Each of them presents a novel approach. There are always new ideas and new results. It was a compulsion for him to present each argument in its purest form, to replace computation by conceptual arguments, to strip the theory of unnecessary ballast. What was the decisive point for him was to show the beauty of the subject to the reader.'' Information for our distributors: Copublished with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

Modern Higher Algebra - Emil Artin 2013-04

A Course in Algebra - Ėrnest Borisovich Vinberg 2003

Great book! The author's teaching experinece shows in every chapter. --Efim Zelmanov, University of California, San Diego Vinberg has written an algebra book that is excellent, both as a classroom text or for self-study. It is plain that years of teaching abstract algebra have enabled him to say the right thing at the right time. --Irving Kaplansky, MSRI This is a comprehensive text on modern algebra written for advanced undergraduate and basic graduate algebra classes. The book is based on courses taught by the author at the Mechanics and Mathematics Department of Moscow State University and at the Mathematical College of the Independent University of Moscow. The unique feature of the book is that it contains almost no technically difficult proofs. Following his point of view on mathematics, the author tried, whenever possible, to replace calculations and difficult deductions with conceptual proofs and to associate geometric images to algebraic objects. Another important feature is that the book presents most of the topics on several levels, allowing the student to move smoothly from initial acquaintance to thorough study and deeper understanding of the subject. Presented are basic topics in algebra such as algebraic structures, linear algebra, polynomials, groups, as well as more advanced topics like affine and projective spaces, tensor algebra, Galois theory, Lie groups, associative algebras and their representations. Some applications of linear algebra and group theory to physics are discussed. Written with extreme care and supplied with more than 200 exercises and 70 figures, the book is also an excellent text for independent study.

Algebra in Action: A Course in Groups, Rings, and Fields - Shahriar Shahriar 2017-08-16

This text—based on the author's popular courses at Pomona College—provides a readable, student-friendly, and somewhat sophisticated introduction to abstract algebra. It is aimed at sophomore or junior undergraduates who are seeing the material for the first time. In addition to the usual definitions and theorems, there is ample discussion to help students build intuition and learn how to think about the abstract concepts. The book has over 1300 exercises and mini-projects of varying degrees of difficulty, and, to facilitate active learning and self-study, hints and short answers for many of the problems are provided. There are full solutions to over 100 problems in order to augment the text and to model the writing of solutions. Lattice diagrams are used throughout to visually demonstrate results and proof techniques. The book covers groups, rings, and fields. In group theory, group actions are the unifying theme and are introduced early. Ring theory is motivated by what is needed for solving Diophantine equations, and, in field theory, Galois theory and the solvability of polynomials take center stage. In each area, the text goes deep enough to demonstrate the power of abstract thinking and to convince the reader that the subject is full of unexpected results.

Undergraduate Algebraic Geometry - Miles Reid 1988-12-15

Algebraic geometry is, essentially, the study of the solution of equations and occupies a central position in pure mathematics. This short and readable introduction to algebraic geometry will be ideal for all undergraduate mathematicians coming to the subject for the first time. With the minimum of prerequisites, Dr Reid introduces the reader to the basic concepts of algebraic geometry including: plane conics, cubics and the group law, affine and projective varieties, and non-singularity and dimension. He is at pains to stress the connections the subject has with commutative algebra as well as its relation to topology, differential geometry, and number theory. The book arises from an undergraduate course given at the University of Warwick and contains numerous examples and exercises illustrating the theory.

Classical Galois Theory with Examples - Lisl Gaal 1998

Galois theory is one of the most beautiful subjects in mathematics, but it is heard to appreciate this fact fully without seeing specific examples. Numerous examples are therefore included throughout the text, in the hope that they will lead to a deeper understanding and genuine appreciation of the more abstract and advanced literature on Galois theory. This book is intended for beginning graduate students who already have some background in algebra, including some elementary theoryof groups, rings and fields. The expositions and proofs are intended to present Galois theory in as simple a manner as possible, sometimes at the expense of brevity. The book is for students and intends to make them take an active part in mathematics rather than merely read, nod their heads atappropriate places, skip the exercises, and continue on to the next section.

Algebraic Groups and Differential Galois Theory - Teresa Crespo 2011

Differential Galois theory has seen intense research activity during the last decades in several directions: elaboration of more general theories, computational aspects, model theoretic approaches, applications to classical and quantum mechanics as well as to other mathematical areas such as number theory. This book intends to introduce the reader to this subject by presenting Picard-Vessiot theory, i.e. Galois theory of linear differential equations, in a self-contained way. The needed prerequisites from algebraic geometry and algebraic groups are contained in the first two parts of the book. The third part includes Picard-Vessiot extensions, the fundamental theorem of Picard-Vessiot theory, solvability by quadratures, Fuchsian equations, monodromy group and Kovacic's algorithm. Over one hundred exercises will help to assimilate the concepts and to introduce the reader to some topics beyond the scope of this book. This book is suitable for a graduate course in differential Galois theory. The last chapter contains several suggestions for further reading encouraging the reader to enter more deeply into different topics of differential Galois theory or related fields.

Algebra with Galois Theory - Emil Artin 2007

'Algebra with Galois Theory' is based on lectures by Emil Artin. The book is an ideal textbook for instructors and a supplementary or primary textbook for students.

Separable Algebras - Timothy J. Ford 2017-09-26

This book presents a comprehensive introduction to the theory of separable algebras over commutative rings. After a thorough introduction to the general theory, the fundamental roles played by separable algebras are explored. For example, Azumaya algebras, the henselization of local rings, and Galois theory are rigorously introduced and treated. Interwoven throughout these applications is the important notion of étale algebras. Essential connections are drawn between the theory of separable algebras and Morita theory, the theory of faithfully flat descent, cohomology, derivations, differentials, reflexive lattices, maximal orders, and class groups. The text is accessible to graduate students who have finished a first course in algebra, and it includes necessary foundational material, useful exercises, and many nontrivial examples.

Mathematics via Problems - Arkadiy Skopenkov 2021-02-11

This book is a translation from Russian of Part I of the book Mathematics Through Problems:

From Olympiads and Math Circles to Profession. The other two parts, Geometry and Combinatorics, will be published soon. The main goal of this book is to develop important parts of mathematics through problems. The author tries to put together sequences of problems that allow high school students (and some undergraduates) with strong interest in mathematics to discover and recreate much of elementary mathematics and start edging into the sophisticated world of topics such as group theory, Galois theory, and so on, thus building a bridge (by showing that there is no gap) between standard high school exercises and more intricate and abstract concepts in mathematics. Definitions and/or references for material that is not standard in the school curriculum are included. However, many topics in the book are difficult when you start learning them from scratch. To help with this, problems are carefully arranged to provide gradual introduction into each subject. Problems are often accompanied by hints and/or complete solutions The book is based on classes taught by the author at different times at the Independent University of Moscow, at a number of Moscow schools and math circles, and at various summer schools. It can be used by high school students and undergraduates, their teachers, and organizers of summer camps and math circles. 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.

Problems in Abstract Algebra - A. R. Wadsworth 2017-05-10

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.

Abstract Algebra - Joseph H. Silverman 2022-03-07

This abstract algebra textbook takes an integrated approach that highlights the similarities of fundamental algebraic structures among a number of topics. The book begins by introducing groups, rings, vector spaces, and fields, emphasizing examples, definitions, homomorphisms, and proofs. The goal is to explain how all of the constructions fit into an axiomatic framework and to emphasize the importance of studying those maps that preserve the underlying algebraic structure. This fast-paced introduction is followed by chapters in which each of the four main topics is revisited and deeper results are proven. The second half of the book contains material of a more advanced nature. It includes a thorough development of Galois theory, a chapter on modules, and short surveys of additional algebraic topics designed to whet the reader's appetite for further study. This book is intended for a first introduction to abstract algebra and requires only a course in linear algebra as a prerequisite. The more advanced material could be used in an introductory graduate-level course.

Galois Theory Through Exercises - Juliusz Brzeziński 2018-03-21

This textbook offers a unique introduction to classical Galois theory through many concrete examples and exercises of varying difficulty (including computer-assisted exercises). In addition to covering standard material, the book explores topics related to classical problems such as Galois’ theorem on solvable groups of polynomial equations of prime degrees, Nagell's proof of non-solvability by radicals of quintic equations, Tschirnhausen's transformations, lunes of Hippocrates, and Galois' resolvents. Topics related to open conjectures are also discussed, including exercises related to the inverse Galois problem and cyclotomic fields. The author presents proofs of theorems, historical comments and useful references alongside the exercises, providing readers with a well-rounded introduction to the subject and a gateway to further reading. A valuable reference and a rich source of exercises with sample solutions, this book will be useful to both students and lecturers. Its original concept makes it particularly suitable for self-study.