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# *1st Course In Abstract Algebra Fraleigh*

Realizing the specific needs of first-year graduate students, this reference allows readers to grasp and master fundamental concepts in abstract algebra-establishing a clear understanding of basic linear algebra and number, group, and commutative ring theory and progressing to sophisticated discussions on Galois and Sylow theory, the structure of abelian groups, the Jordan canonical form, and linear transformations and their matrix representations.

This spectacularly clear introduction to abstract algebra is designed to make the study of all required topics and the reading and writing of proofs both accessible and enjoyable for

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readers encountering the subject for the first time. Number Theory. Groups. Commutative Rings. Modules. Algebras. Principal Idea Domains. Group Theory II. Polynomials In Several Variables. For anyone interested in learning abstract algebra. Linear Algebra: A First Course with Applications explores the fundamental ideas of linear algebra, including vector spaces, subspaces, basis, span, linear independence, linear transformation, eigenvalues, and eigenvectors, as well as a variety of applications, from inventories to graphics to Google's PageRank. Unlike other texts on the subject, this classroom-tested book gives students enough time to absorb the material by focusing on vector spaces early on and using computational sections as numerical interludes. It offers

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introductions to Maple™, MATLAB®, and TI-83 Plus for calculating matrix inverses, determinants, eigenvalues, and eigenvectors. Moving from the specific to the general, the author raises questions, provides motivation, and discusses strategy before presenting answers. Discussions of motivation and strategy include content and context to help students learn.

Considered a classic by many, A First Course in Abstract Algebra is an in-depth introduction to abstract algebra. Focused on groups, rings and fields, this text gives students a firm foundation for more specialised work by emphasising an understanding of the nature of algebraic structures. The full text downloaded to your computer  
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**essential for chemical engineers, mechanical engineers, applied mathematicians, and students. Introduction to Abstract Algebra, Second Edition presents abstract algebra as the main tool underlying discrete mathematics and the digital world. It avoids the usual groups first/rings first dilemma by introducing semigroups and monoids, the multiplicative structures of rings, along with groups. This new edition of a widely adopted textbook covers applications from biology, science, and engineering. It**

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**offers numerous updates based on feedback from first edition adopters, as well as improved and simplified proofs of a number of important theorems. Many new exercises have been added, while new study projects examine skewfields, quaternions, and octonions. The first three chapters of the book show how functional composition, cycle notation for permutations, and matrix notation for linear functions provide techniques for practical computation. These three chapters provide a quick introduction to algebra,**

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**sufficient to exhibit irrational numbers or to gain a taste of cryptography. Chapters four through seven cover abstract groups and monoids, orthogonal groups, stochastic matrices, Lagrange's theorem, groups of units of monoids, homomorphisms, rings, and integral domains. The first seven chapters provide basic coverage of abstract algebra, suitable for a one-semester or two-quarter course. Each chapter includes exercises of varying levels of difficulty, chapter notes that point out variations in notation and approach, and study projects**



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**that cover an array of applications and developments of the theory. The final chapters deal with slightly more advanced topics, suitable for a second-semester or third-quarter course. These chapters delve deeper into the theory of rings, fields, and groups. They discuss modules, including vector spaces and abelian groups, group theory, and quasigroups. This textbook is suitable for use in an undergraduate course on abstract algebra for mathematics, computer science, and education**

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projects at the end of each section. This text introduces readers to the algebraic concepts of group and rings, providing a comprehensive discussion of theory as well as a significant number of applications for each. Number Theory: Induction; Binomial Coefficients; Greatest Common Divisors; The Fundamental Theorem of Arithmetic Congruences; Dates and Days. Groups I: Some Set Theory; Permutations; Groups; Subgroups and Lagrange's Theorem; Homomorphisms; Quotient Groups; Group Actions; Counting with Groups. Commutative Rings I: First Properties; Fields; Polynomials; Homomorphisms; Greatest

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Common Divisors; Unique Factorization; Irreducibility; Quotient Rings and Finite Fields; Officers, Magic, Fertilizer, and Horizons. Linear Algebra: Vector Spaces; Euclidean Constructions; Linear Transformations; Determinants; Codes; Canonical Forms. Fields: Classical Formulas; Insolvability of the General Quintic; Epilog. Groups II: Finite Abelian Groups; The Sylow Theorems; Ornamental Symmetry. Commutative Rings III: Prime Ideals and Maximal Ideals; Unique Factorization; Noetherian Rings; Varieties; Grobner Bases. For all readers interested in abstract algebra.

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contained introduction to the main topics of algebra, suitable for a first sequence on the subject at the beginning graduate or upper undergraduate level. The primary distinguishing feature of the book, compared to standard textbooks in algebra, is the early introduction of categories, used as a unifying theme in the presentation of the main topics. A second feature consists of an emphasis on homological algebra: basic notions on complexes are presented as soon as modules have been introduced, and an extensive last chapter on homological algebra can form the basis for a follow-up introductory course on the subject. Approximately 1,000 exercises

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both provide adequate practice to consolidate the understanding of the main body of the text and offer the opportunity to explore many other topics, including applications to number theory and algebraic geometry. This will allow instructors to adapt the textbook to their specific choice of topics and provide the independent reader with a richer exposure to algebra. Many exercises include substantial hints, and navigation of the topics is facilitated by an extensive index and by hundreds of cross-references.

This book explores the history of abstract algebra. It shows how abstract algebra has arisen in attempting to solve some of these



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classical problems, providing a context from which the reader may gain a deeper appreciation of the mathematics involved.

Proofs and Fundamentals

An Introductory Course

A First Course in Abstract Mathematics

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economics to science students. All major topics of linear algebra are available in detail, as well as justifications of important results. In addition, connections to topics covered in advanced courses are introduced. The textbook is designed in a modular fashion to maximize flexibility and facilitate adaptation to a given course outline and student profile. Each chapter begins with a list of student learning outcomes, and examples and diagrams are given throughout the text to reinforce ideas and provide guidance on how to approach various problems. Suggested exercises are included at the end

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of each section, with selected answers at the end of the textbook."--BCcampus website. 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,

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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.

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student familiarity with applications. 1990 edition. Abstract Algebra: Theory and Applications is an open-source textbook that is designed to teach the principles and theory of abstract algebra to college juniors and seniors in a rigorous manner. Its strengths include a wide range of exercises, both computational and theoretical, plus many non-trivial applications. The first half of the book presents group theory, through the Sylow theorems, with enough material for a semester-long course. The second half is suitable for a second semester and presents

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algebra deals with vector spaces, linear transformations, Eigen spaces, diagonalizable operators, inner product spaces, dual spaces, operators on inner product spaces etc. The theory has been strongly supported by numerous examples and worked-out problems. There is also plenty of scope for the readers to try and solve problems on their own.

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A First Graduate Course in Abstract Algebra  
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**properties of the integers and equivalence relations. The author then explores the first major algebraic structure, the group, progressing as far as the Sylow theorems and the classification of finite abelian groups. An introduction to ring theory follows, leading to a discussion of fields and polynomials that includes sections on splitting fields and the construction of finite fields. The final part contains applications to public key cryptography as well as classical straightedge and compass constructions. Explaining key topics at a gentle pace, this book is aimed at undergraduate students.**

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**Since abstract algebra is so important to the study of advanced mathematics, it is critical that students have a firm grasp of its principles and underlying theories before moving**

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**on to further study. To accomplish this, they require a concise, accessible, user-friendly textbook that is both challenging and stimulating. A First Graduate Course in Abstract Algebra is just such a textbook. Divided into two sections, this book covers both the standard topics (groups, modules, rings, and vector spaces) associated with abstract algebra and more advanced topics such as Galois fields, noncommutative rings, group extensions, and Abelian groups. The author includes review material where needed instead of in a single chapter, giving convenient access with minimal page turning. He**

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**also provides ample examples, exercises, and problem sets to reinforce the material. This book illustrates the theory of finitely generated modules over principal ideal domains, discusses tensor products, and demonstrates the development of determinants. It also covers Sylow theory and Jordan canonical form. A First Graduate Course in Abstract Algebra is ideal for a two-semester course, providing enough examples, problems, and exercises for a deep understanding. Each of the final three chapters is logically independent and can be covered in any order, perfect for a**

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*what they should write and how these two are often not the same.*

*Studying abstract algebra can be an adventure of awe-inspiring discovery. The subject need not be watered down nor should it be presented as if all students will become mathematics instructors. This is a beautiful, profound, and useful field which is part of the shared language of many areas both within and outside of mathematics. To begin this journey of discovery, some experience with mathematical reasoning is beneficial. This text takes a fairly rigorous approach to its subject, and*

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*expects the reader to understand and create proofs as well as examples throughout. The book follows a single arc, starting from humble beginnings with arithmetic and high-school algebra, gradually introducing abstract structures and concepts, and culminating with Niels Henrik Abel and Evariste Galois' achievement in understanding how we can—and cannot—represent the roots of polynomials. The mathematically experienced reader may recognize a bias toward commutative algebra and fondness for number theory. The presentation*



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*includes the following features: Exercises are designed to support and extend the material in the chapter, as well as prepare for the succeeding chapters. The text can be used for a one, two, or three-term course. Each new topic is motivated with a question. A collection of projects appears in Chapter 23. Abstract algebra is indeed a deep subject; it can transform not only the way one thinks about mathematics, but the way that one thinks—period. This book is offered as a manual to a new way of thinking. The author's aim is to instill the desire to understand the material, to*

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*encourage more discovery, and to develop an appreciation of the subject for its own sake.*

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*Discovering Abstract Algebra takes an Inquiry-Based Learning approach to the subject, leading students to discover for themselves its*

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**chapter includes a short discussion of the connections among topics in ring theory and group theory. These discussions help students see the relationships between the two main types of algebraic objects studied throughout the text. Encouraging students to do mathematics and be more than passive learners, this text shows students that the way mathematics is developed is often different than how it is presented; that definitions, theorems, and proofs do not simply appear fully formed in the minds of mathematicians; that mathematical ideas are highly interconnected; and**

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**that even in a field like abstract algebra, there is a considerable amount of intuition to be found.**

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