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Nota di contenuto	Preface; Contents; Part I The Integers; 1 Number Concepts, Prime Numbers, and the Division Algorithm; 1.1 Beginning Number Concepts and Prime Numbers; 1.2 Divisibility of Some Combinations of Integers; 1.3 Long Division: The Division Algorithm; 1.4 Tests for Divisibility in Base Ten; 1.5 Binary and Other Number Systems; 1.5.1 Conversion Between Binary and Decimal; 1.5.2 Conversion from Decimal to Binary; 1.5.3 Arithmetic in Binary Systems; Addition of Binary Numbers; Multiplication of Binary Numbers; Subtraction in the Binary System; Division in the Binary System 1.5.4 Duodecimal Number SystemConversion from Decimal to Duodecimal System; Conversion from Duodecimal to Decimal System; 2 Greatest Common Divisors, Diophantine Equations, and Combinatorics; 2.1 GCD and LCM Through the Fundamental Theorem of Arithmetic; 2.2 GCD, the Euclidean Algorithm and Its Byproducts; 2.3 Linear Equations with Integer Solutions: Diophantine Equations; 2.4 A Brief Introduction to Combinatorics; 2.5 Linear Diophantine Equations and Counting; 3 Equivalence Classes with Applications to Clock Arithmetic

and Fractions; 3.1 Equivalence Relations and Equivalence Classes
3.2 Modular (Clock) Arithmetic Through Equivalence Relations3.3 Fractions Through Equivalence Relations; 3.4 Integers Modular n and Applications; 3.4.1 RSA Cryptosystem; 3.4.2 UPC and ISBN (See Gallin and Winters Gallian1988, Rosen Rosen2007); Part II The Algebra of Polynomials and Linear Systems; 4 Polynomials and the Division Algorithm; 4.1 Addition and Multiplication of Polynomials; 4.2 Divisibility, Quotients and Remainders of Polynomials; 4.3 The Remainder Theorem; 4.4 Synthetic Division; 5 Factoring Polynomials, Their Roots, and Some Applications
5.1 Factoring Polynomials and Their Roots5.2 Rational Roots of Polynomials; 5.2.1 Appendix to Sect.5.2: A Brief Review of Factoring Quadratics; 5.3 Greatest Common Divisors and Least Common Multiples for Polynomials; 6 Matrices and Systems of Linear Equations ; 6.1 Matrix Operations; 6.2 Systems of Linear Equations in the Plane; 6.3 Systems of Linear Equations in Euclidean n-Space; 6.4 System of Linear Equations: Cramer's Rule; 6.5 Applications of Matrix Operations to the GCD; 6.6 Evaluations of Determinants of 33 Matrices; 6.7 Application of Determinants (Line and Area); Selected Answers
Section 1.1Section 1.2; Section 1.3; Section 1.4; Section 1.5; Section 2.1; Section 2.2; Section 2.3; Section 2.4; Section 2.5; Section 3.1; Section 3.2; Section 3.3; Section 3.4; Section 4.1; Section 4.2; Section 4.3; Section 4.4; Section 5.1; Section 5.2; Section 5.3; Section 6.1; Section 6.2; Section 6.3; Section 6.4; Section 6.5; Section 6.6; Section 6.7; References

Sommario/riassunto

Designed to facilitate the transition from undergraduate calculus and differential equations to learning about proofs, this book helps students develop the rigorous mathematical reasoning needed for advanced courses in analysis, abstract algebra, and more. Students will focus on both how to prove theorems and solve problem sets in-depth; that is, where multiple steps are needed to prove or solve. This proof technique is developed by examining two specific content themes and their applications in-depth: number theory and algebra. This choice of content themes enables students to develop an understanding of proof technique in the context of topics with which they are already familiar, as well as reinforcing natural and conceptual understandings of mathematical methods and styles. The key to the text is its interesting and intriguing problems, exercises, theorems, and proofs, showing how students will transition from the usual, more routine calculus to abstraction while also learning how to “prove” or “solve” complex problems. This method of instruction is augmented by examining applications of number theory in systems such as RSA cryptography, Universal Product Code (UPC), and International Standard Book Number (ISBN). The numerous problems and examples included in each section reward curiosity and insightfulness over more simplistic approaches. Each problem set begins with a few easy problems, progressing to problems or proofs with multi-step solutions. Exercises in the text stay close to the examples of the section, allowing students the immediate opportunity to practice developing techniques. Beyond the undergraduate mathematics student audience, the text can also offer a rigorous treatment of mathematics content (numbers and algebra) for high achieving high school students. Furthermore, prospective teachers will add to the breadth of the audience as math education majors, will understand more thoroughly methods of proof, and will add to the depth of their mathematical knowledge.