An Introduction To Diophantine Equations Diendantoanhoc

This text provides a detailed introduction to number theory, demonstrating how other areas of mathematics enter into the study of the properties of natural numbers. It contains problem sets within each section and at the end of each chapter to reinforce essential concepts, and includes up-to-date information on divisibility problems, polynomial congruence, the sums of squares and trigonometric sums.;Five or more copies may be ordered by college or university bookstores at a special price, available on application.

Geometry and the theory of numbers are as old as some of the oldest historical records of humanity. Ever since antiquity, mathematicians have discovered many beautiful interactions between the two subjects and recorded them in such classical texts as Euclid's Elements and Diophantus's Arithmetica. Nowadays, the field of mathematics that studies the interactions between number theory and algebraic geometry is known as arithmetic geometry. This book is an introduction to number theory and arithmetic geometry, and the goal of the text is to use geometry as the motivation to prove the main theorems in the book. For example, the fundamental theorem of arithmetic is a consequence of the tools we develop in order to find all the integral points on a line in the plane. Similarly, Gauss's law of quadratic reciprocity and the theory of continued fractions naturally arise when we attempt to determine the integral points on a curve in the plane given by a quadratic polynomial equation. After an introduction to the theory of diophantine equations, the rest of the book is structured in three acts that correspond to the study of the integral and rational solutions of linear, quadratic, and cubic curves, respectively. This book describes many applications including modern applications in cryptography; it also presents some recent results in arithmetic geometry. With many exercises, this book can be used as a text for a first course in number theory or for a subsequent course on arithmetic (or diophantine) geometry at the junior-senior level.

This is an introduction to diophantine geometry at the advanced graduate level. The book contains a proof of the Mordell conjecture which will make it quite attractive to graduate students and professional mathematicians. In each part of the book, the reader will find numerous exercises.

"This book by a leading researcher and masterly expositor of the subject studies diophantine approximations to algebraic numbers and their applications to diophantine equations. The methods are classical, and the results stressed can be obtained without much background in algebraic geometry. In particular, Thue equations, norm form equations and S-unit equations, with emphasis on recent explicit bounds on the number of solutions, are included. The book will be useful for graduate students and researchers." (L'Enseignement Mathematique) "The rich Bibliography includes more than hundred references. The book is easy to read, it may be a useful piece of reading not only for experts but for students as well." Acta Scientiarum Mathematicarum

In a manner accessible to beginning undergraduates, An Invitation to Modern Number Theory introduces many of the central problems, conjectures, results, and techniques of the field, such as the Riemann Hypothesis, Roth's Theorem, the Circle Method, and Random Matrix Theory. Showing how experiments are used to test conjectures and prove theorems, the book allows students to do original work on such problems, often using little more than calculus (though there are numerous remarks for those with deeper backgrounds). It shows students what number theory theorems are used for and what led to them and suggests problems for further research. Steven Miller and Ramin Takloo-Bighash introduce the problems and the computational skills required to numerically investigate them, providing background material (from probability to statistics to Fourier analysis) whenever necessary. They guide students through a variety of problems, ranging from basic number theory, cryptography, and Goldbach's Problem, to the algebraic structures of numbers and continued fractions, showing connections between these subjects and encouraging students to study them further. In addition, this is the first undergraduate book to explore Random Matrix Theory, which has recently become a powerful tool for predicting answers in number theory. Providing exercises, references to the background literature, and Web links to previous student research projects, An Invitation to Modern Number Theory can be used to teach a research seminar or a lecture class.

Welcome to diophantine analysis--an area of number theory in which we attempt to discover hidden treasures and truths within the jungle of numbers by exploring rational numbers. Diophantine analysis comprises two different but interconnected domains--diophantine approximation and diophantine equations. This highly readable book brings to life the fundamental ideas and theorems from diophantine approximation, geometry of numbers, diophantine geometry and p-adic analysis. Through an engaging style, readers participate in a journey through these areas of number theory. Each mathematical theme is presented in a self-contained manner and is motivated by very basic notions. The reader becomes an active participant in the explorations, as each module includes a sequence of numbered questions to be answered and statements to be verified. Many hints and remarks are provided to be freely used and enjoyed. Each module then closes with a Big Picture Question that invites the reader to step back from all the technical details and take a panoramic view of how the ideas at hand fit into the larger mathematical landscape. This book enlists the reader to build intuition, develop ideas and prove results in a very user-friendly and enjoyable environment. Little background is required and a familiarity with number theory is not expected. All that is needed for most of the material is an understanding of calculus and basic linear algebra together with the desire and ability to prove theorems. The minimal background requirement combined with the author's fresh approach and engaging style make this book enjoyable and accessible to second-year undergraduates, and even advanced high school students. The author's refreshing new spin on more traditional discovery approaches makes this book appealing to any mathematician and/or fan of number theory.

This self-contained treatment covers approximation of irrationals by rationals, product of linear forms, multiples of an irrational number, approximation of complex numbers, and product of complex linear forms. 1963 edition.

Quadratics
An Introduction to Diophantine Equations for Control Theory
Quadratic Diophantine Equations
Number Theory Revealed: An Introduction
A Problem-Based Approach
The Algorithmic Resolution of Diophantine Equations
A Journey Into Diophantine Analysis
Introduction to Number Theory
Curves, Counting, and Number Theory

Challenging, accessible mathematical adventures involving prime numbers, number patterns, irrationals and iterations, calculating prodigies, and more. No special training is needed, just high school mathematics and an inquisitive mind. "A splendidly written, well selected and presented collection. I recommend the book unreservedly to all readers." — Martin Gardner.

Number Theory in Science and Communication introductes non-mathematicians to the fascinating and diverse applications of number theory. This best-selling book stresses intuitive understanding rather than abstract theory. This revised fourth edition is augmented by recent advances in primes in progressions, twin primes, prime triplets, prime quadruplets and quintruplets, factoring with elliptic curves, quantum factoring, Golomb rulers and "baroque" integers.

Diophantine Equations

Number theory as studied by the logician is the subject matter of the book. This first volume can stand on its own as a somewhat unorthodox introduction to mathematical logic for undergraduates, dealing with the usual introductory material: recursion theory, first-order logic, completeness, incompleteness, and undecidability. In addition, its second chapter contains the most complete logical discussion of Diophantine Decision Problems available anywhere, taking the reader right up to the frontiers of research (yet remaining accessible to the undergraduate). The first and third chapters also offer greater depth and breadth in logico-arithmetical matters than can be found in existing logic texts. Each chapter contains numerous exercises, historical and other comments aimed at developing the student's perspective on the subject, and a partially annotated bibliography.

This book presents material suitable for an undergraduate course in elementary number theory from a computational perspective. It seeks to not only introduce students to the standard topics in elementary number theory, such as prime factorization and modular arithmetic, but also to develop their ability to formulate and test precise conjectures from experimental data. Each topic is motivated by a question to be answered, followed by some experimental data, and, finally, the statement and proof of a theorem. There are numerous opportunities throughout the chapters and exercises for the students to engage in (guided) open-ended exploration. At the end of a course using this book, the students will understand how mathematics is developed from asking questions to gathering data to formulating and proving theorems. The mathematical prerequisites for this book are few. Early chapters contain topics such as integer divisibility, modular arithmetic, and applications to cryptography, while later chapters contain more specialized topics, such as Diophantine approximation, number theory of dynamical systems, and number theory with polynomials. Students of all levels will be drawn in by the patterns and relationships of number theory uncovered through data driven exploration.

This text treats the classical theory of quadratic diophantine equations and guides the reader through the last two decades of computational techniques and progress in the area. The presentation features two basic methods to investigate and motivate the study of quadratic diophantine equations: the theories of continued fractions and quadratic fields. It also discusses Pell's equation and its generalizations, and presents some important quadratic diophantine equations and applications. The inclusion of examples makes this book useful for both research and classroom settings.

This textbook presents an elementary introduction to number theory and its different aspects: approximation of real numbers, irrationality and transcendence problems, continued fractions, diophantine equations, quadratic forms, arithmetical functions and algebraic number theory. Clear, concise, and self-contained, the topics are covered in 12 chapters with more than 200 solved exercises. The textbook may be used by undergraduates and graduate students, as well as high school mathematics teachers. More generally, it will be suitable for all those who are interested in number theory, the fascinating branch of mathematics.

Exponential Diophantine Equations
New Computational Methods
Theory and Algorithms
Diophantus and Diophantine Equations
An Introduction to Number Theory
An Introduction to the Theory of Numbers
Excursions in Number Theory
Unit Equations in Diophantine Number Theory
An Introduction to Diophantine Equations

This collection of course notes from a number theory summer school focus on aspects of Diophantine Analysis, addressed to Master and doctoral students as well as everyone who wants to learn the subject. The topics range from Baker's method of bounding linear forms in logarithms (authored by Sanda Buja?i? and Alan Filipin), metric diophantine approximation discussing in particular the yet unsolved Littlewood conjecture (by Simon Kristensen), Minkowski's geometry of numbers and modern variations by Bombieri and Schmidt (Tapani Matala-aho), and a historical account of related number theory(ists) at the turn of the 19th Century (Nicola M.R. Oswald). Each of these notes serves as an essentially self-contained introduction to the topic. The reader gets a thorough impression of Diophantine Analysis by its central results, relevant applications and open problems. The notes are complemented with many references and an extensive register which makes it easy to navigate through the book.

The first thing you will find out about this book is that it is fun to read. It is meant for the browser, as well as for the student and for the specialist wanting to know about the area. The footnotes give an historical background to the text, in addition to providing deeper applications of the concept that is being cited. This allows the browser to look more deeply into the history or to pursue a given sideline. Those who are only marginally interested in the area will be able to read the text, pick up information easily, and be entertained at the same time by the historical and philosophical digressions. It is rich in structure and motivation in its concentration upon quadratic orders. This is not a book that is primarily about tables, although there are 80 pages of appendices that contain extensive tabular material (class numbers of real and complex quadratic fields up to 104; class group structures; fundamental units of real quadratic fields; and more!). This book is primarily a reference book and graduate student text with more than 200 exercises and a great deal of hints! The motivation for the text is best given by a quote from the Preface of Quadratics: "There can be no stronger motivation in mathematical inquiry than the search for truth and beauty. It is this author's long-standing conviction that number theory has the best of both of these worlds. In particular, algebraic and computational number theory have reached a stage where the current state of affairs richly deserves a proper elucidation. It is this author's goal to attempt to shine the best possible light on the subject."

Number Theory Revealed: An Introduction acquaints undergraduates with the "Queen of Mathematics". The text offers a fresh take on congruences, power residues, quadratic residues, primes, and Diophantine equations and presents hot topics like cryptography, factoring, and primality testing. Students are also introduced to beautiful enlightening questions like the structure of Pascal's triangle mod p p and modern twists on traditional questions like the values represented by binary quadratic forms and large solutions of equations. Each chapter includes an "elective appendix" with additional reading, projects, and references. An expanded edition, Number Theory Revealed: A Masterclass, offers a more comprehensive approach to these core topics and adds additional material in further chapters and appendices, allowing instructors to create an individualized course tailored to their own (and their students') interests.

This book tells the story of Diophantine analysis, a subject that, owing to its thematic proximity to algebraic geometry, became fashionable in the last half century and has remained so ever since. This new treatment of the methods of Diophantus--a person whose very existence has long been doubted by most historians of mathematics--will be accessible to readers who have taken some university mathematics. It includes the elementary facts of algebraic geometry indispensable for its understanding. The heart of the book is a fascinating account of the development of Diophantine methods during the.

This is a integrated presentation of the theory of exponential diophantine equations. The authors present, in a clear and unified fashion, applications to exponential diophantine equations and linear recurrence sequences of the Gelfond-Baker theory of linear forms in logarithms of algebraic numbers. Topics covered include the Thue equations, the generalised hyperelliptic equation, and the Fermat and Catalan equations. The necessary preliminaries are given in the first three chapters. Each chapter ends with a section giving details of related results.

Work examines the latest algorithms and tools to solve classical types of diophantine equations.; Unique book---closest competitor, Smart, Cambridge, does not treat index form equations.; Author is a leading researcher in the field of computational algebraic number theory.; The text is illustrated with several tables of various number fields, including their data on power integral bases.; Several interesting properties of number fields are examined.; Some infinite parametric families of fields are also considered as well as the resolution of the corresponding infinite parametric families of diophantine equations.

A special feature of Nagell's well-known text is the rather extensive treatment of Diophantine equations of second and higher degree. A large number of non-routine problems are given. Reviews & Endorsements This is a very readable introduction to number theory, with particular emphasis on diophantine equations, and requires only a school knowledge of mathematics. The exposition is admirably clear. More advanced or recent work is cited as background, where relevant … [T]here are welcome novelties: Gauss's own evaluation of Gauss's sums, which is still perhaps the most elegant, is reproduced apparently for the first time. There are 180 examples, many of considerable interest, some of these being little known. -- Mathematical Reviews

An Invitation to Modern Number Theory
Elliptic Tales
Diophantine Approximations
Logical Number Theory I
An Experimental Introduction to Number Theory
An Introduction
Diophantine Geometry
Analytic Methods for Diophantine Equations and Diophantine Inequalities
Diophantine Analysis

Elliptic Tales describes the latest developments in number theory by looking at one of the most exciting unsolved problems in contemporary mathematics--the Birch and Swinnerton-Dyer Conjecture. The Clay Mathematics Institute is offering a prize of $1 million to anyone who can discover a general solution to the problem. The key to the conjecture lies in elliptic curves, which are cubic equations in two variables. These equations may appear simple, yet they arise from some very deep--and often very mystifying--mathematical ideas. Using only basic algebra and calculus while presenting numerous eye-opening examples, Ash and Gross make these ideas accessible to general readers, and, in the process, venture to the very frontiers of modern mathematics. Along the way, they give an informative and entertaining introduction to some of the most profoundmay appear simple, yet they arise from some very deep--and often very mystifying--mathematical ideas. Using only basic algebra and calculus while presenting numerous eye-opening examples, Ash and Gross make these ideas accessible to general readers, and, in the process, venture to the very frontiers of modern mathematics. Along the way, they give an informative and entertaining introduction to some of the most profound discoveries of the last three centuries in algebraic geometry, abstract algebra, and number theory. They demonstrate how mathematics grows more abstract to tackle ever more challenging problems, and how each new generation of mathematicians builds on the accomplishments of those who preceded them. Ash and Gross fully explain how the Birch and Swinnerton-Dyer Conjecture sheds light on the number theory of elliptic curves, and how it provides a beautiful and startling connection between two very different objects arising from an elliptic curve, one based on calculus, the other on algebra.

Pell□s Equation is a very simple Diophantine equation that has been known to mathematicians for over 2000 years. Even today research involving this equation continues to be very active, as can be seen by the publication of at least 150 articles related to this equation over the past decade. However, very few modern books have been published on Pell□s Equation, and this will be the first to give a historical development of the equation, as well as to develop the necessary tools for solving the equation. The authors provide a friendly introduction for advanced undergraduates to the delights of algebraic number theory via Pell□s Equation. The only prerequisites are a basic knowledge of elementary number theory and abstract algebra. There are also numerous references and notes for those who wish to follow up on various topics.

"A unique collection of topics centered on a unifying topic. Includes more than 350 exercises. Text is largely self-contained. The central theme of this graduate-level number theory textbook is the solution of Diophantine equations, i.e., equations or systems of polynomial equations which must be solved in integers, rational numbers or more generally in algebraic numbers. This theme, in particular, is the central motivation for the modern theory of arithmetic algebraic geometry. In this text, this is considered through three aspects. The first is the local aspect: one can do analysis in p-adic fields, and here the author starts by looking at solutions in finite fields, then proceeds to lift these solutions to local solutions using Hensel lifting. The second is the global aspect: the use of number fields, and in particular of class groups and unit groups. This classical subject is here illustrated through a wide range of examples. The third aspect deals with specific classes of equations, and in particular the general and Diophantine study of elliptic curves, including 2 and 3-descent and the Heegner point method. These subjects form the first two parts, forming Volume I. The study of Bernoulli numbers, the gamma function, and zeta and L-functions, and of p-adic analogues is treated at length in the third part of the book, including many interesting and original applications. Much more sophisticated techniques have been brought to bear on the subject of Diophantine equations, and for this reason, the author has included five chapters on these techniques forming the fourth part, which together with the third part forms Volume II. These chapters were written by Yann Bugeaud, Guillaume Hanrot, Maurice Mignotte, Sylvain Duquesne, Samir Siksek, and the author, and contain material on the use of Galois representations, points on higher-genus curves, the superfermat equation, Mihailescu's proof of Catalan's Conjecture, and applications of linear forms in logarithms. The book contains 530 exercises of varying difficulty from immediate consequences of the main text to research problems, and contain many important additional results."--Publisher's website.

Includes up-to-date material on recent developments and topics of significant interest, such as elliptic functions and the new primality test Selects material from both the algebraic and analytic disciplines, presenting several different proofs of a single result to illustrate the differing viewpoints and give good insight

A step-by-step guide to Langlands' early work leading up the Langlands Program for mathematicians and advanced students.

A coherent account of the computational methods used to solve diophantine equations.

Diophantine number theory is an active area that has seen tremendous growth over the past century, and in this theory unit equations play a central role. This comprehensive treatment is the first volume devoted to these equations. The authors gather together all the most important results and look at many different aspects, including effective results on unit equations over number fields, estimates on the number of solutions, analogues for function fields and effective results for unit equations over finitely generated domains. They also present a variety of applications. Introductory chapters provide the necessary background in algebraic number theory and function field theory, as well as an account of the required tools from Diophantine approximation and transcendence theory. This makes the book suitable for young researchers as well as experts who are looking for an up-to-date overview of the field.

Diophantine Equations and Power Integral Bases
Diophantine Approximations and Diophantine Equations
Number Theory in Science and Communication
An Elementary Introduction Through Diophantine Problems
Number Theory: Introduction to diophantine equations
Solving the Pell Equation
Diophantine Equations
Volume II: Analytic and Modern Tools
An Introduction to Pure and Applied Mathematics

This book deals with several aspects of what is now called "explicit number theory." The central theme is the solution of Diophantine equations, i.e., equations or systems of polynomial equations which must be solved in integers, rational numbers or more generally in algebraic numbers. This theme, in particular, is the central motivation for the modern theory of arithmetic algebraic geometry. In this text, this is considered through three of its most basic aspects. The local aspect, global aspect, and the third aspect is the theory of zeta and L-functions. This last aspect can be considered as a unifying theme for the whole subject.

Harold Davenport was one of the truly great mathematicians of the twentieth century. Based on lectures he gave at the University of Michigan in the early 1960s, this book is concerned with the use of analytic methods in the study of integer solutions to Diophantine equations and Diophantine inequalities. It provides an excellent introduction to a timeless area of number theory that is still as widely researched today as it was when the book originally appeared. The three main themes of the book are Waring's problem and the representation of integers by diagonal forms, the solubility in integers of systems of forms in many variables, and the solubility in integers of diagonal inequalities. For the second edition of the book a comprehensive foreword has been added in which three prominent authorities describe the modern context and recent developments. A thorough bibliography has also been added.

This problem-solving book is an introduction to the study of Diophantine equations, a class of equations in which only integer solutions are allowed. The presentation features some classical Diophantine equations, including linear, Pythagorean, and some higher degree equations, as well as exponential Diophantine equations. Many of the selected exercises and problems are original or are presented with original solutions. An Introduction to Diophantine Equations: A Problem-Based Approach is intended for undergraduates, advanced high school students and teachers, mathematical contest participants — including Olympiad and Putnam competitors — as well as readers interested in essential mathematics. The work uniquely presents unconventional and non-routine examples, ideas, and techniques.

A Computational Cookbook
Number Theory
Exploring the Number Jungle
With Applications in Cryptography, Physics, Digital Information, Computing, and Self-Similarity
Course Notes from a Summer School
Algorithms for Diophantine Equations
Number Theory and Geometry: An Introduction to Arithmetic Geometry
The Genesis of the Langlands Program