Diophantine Geometry An Introduction 1st Edition

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Number Theory and Geometry: An Introduction to Arithmetic Geometry - Álvaro Lozano-Robledo 2019-03-21
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.

Integral Points on Algebraic Varieties Pietro Corvaja 2016-11-23

This book is intended to be an introduction to Diophantine geometry. The central theme of the book is to investigate the distribution of integral points on algebraic varieties. This text rapidly introduces problems in Diophantine geometry, especially those involving integral points, assuming a geometrical perspective. It presents recent results not available in textbooks and also new viewpoints on classical material. In some instances, proofs have been replaced by a detailed analysis of particular cases, referring to the quoted papers for complete proofs. A central role is played by Siegel’s finiteness theorem for integral points on curves. The book ends with the analysis of integral points on surfaces.

An Invitation to Arithmetic Geometry - Dino Lorenzini 1996-02-22

Extremely carefully written, masterfully thought out, and skillfully arranged introduction ... to the arithmetic of algebraic curves, on the one hand, and to the algebro-geometric aspects of number theory, on the other hand. ... an excellent guide for beginners in arithmetic

geometry, just as an interesting reference and methodical inspiration for teachers of the subject ... a highly welcome addition to the existing literature. --Zentralblatt MATH The interaction between number theory and algebraic geometry has been especially fruitful. In this volume, the author gives a unified presentation of some of the basic tools and concepts in number theory, commutative algebra, and algebraic geometry, and for the first time in a book at this level, brings out the deep analogies between them. The geometric viewpoint is stressed throughout the book. Extensive examples are given to illustrate each new concept, and many interesting exercises are given at the end of each chapter. Most of the important results in the one-dimensional case are proved, including Bombieri's proof of the Riemann Hypothesis for curves over a finite field. While the book is not intended to be an introduction to schemes, the author indicates how many of the geometric notions introduced in the book relate to schemes, which will aid the reader who goes to the next level of this rich subject.

Heights in Diophantine Geometry - Enrico Bombieri 2007-09-06

Diophantine geometry has been studied by number theorists for thousands of years, since the time of Pythagoras, and has continued to be a rich area of ideas such as Fermat's Last Theorem, and most recently the ABC conjecture. This monograph is a bridge between the classical theory and modern approach via arithmetic geometry. The authors provide a clear path through the subject for graduate students and researchers. They have re-examined many results and much of the literature, and give a thorough account of several topics at a level not seen before in book form. The treatment is largely self-contained, with proofs given in full detail. Many results appear here for the first time. The book concludes with a comprehensive bibliography. It

is destined to be a definitive reference on modern diophantine geometry, bringing a new standard of rigor and elegance to the field.

Exploring the Number Jungle
Edward B. Burger 2000
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.

O-Minimality and Diophantine Geometry - G. O. Jones 2015-08-13

This book brings the researcher up to date with recent applications of mathematical logic to number theory.

Model Theory and Algebraic Geometry - Elisabeth Bouscaren 2009-03-14

This introduction to the recent exciting developments in the applications of model theory to algebraic geometry, illustrated by E. Hrushovski's model-theoretic proof of the geometric Mordell-Lang Conjecture starts from very basic background and works up to the detailed exposition of Hrushovski's proof, explaining the necessary tools and results from stability theory on the way. The first chapter is an informal introduction to model theory itself, making the book accessible (with a little effort) to readers with no previous knowledge of model theory. The authors have collaborated closely to achieve a coherent and self- contained presentation, whereby the completeness of exposition of the chapters varies according to the existence of other good references, but comments and examples are always provided to give the reader some intuitive understanding of the subject.

Notes on Geometry and Arithmetic - Daniel Coray 2020-07-06

This English translation of Daniel Coray’s original French textbook Notes de géométrie et d’arithmétique introduces students to Diophantine geometry. It engages the reader with concrete and interesting problems using the language of classical geometry, setting aside all but the most essential ideas from algebraic geometry and commutative algebra. Readers are invited to discover rational points on varieties through an appealing ‘hands on’ approach that offers a pathway toward active research in arithmetic

geometry. Along the way, the reader encounters the state of the art on solving certain classes of polynomial equations with beautiful geometric realizations, and travels a unique ascent towards variations on the Hasse Principle. Highlighting the importance of Diophantus of Alexandria as a precursor to the study of arithmetic over the rational numbers, this textbook introduces basic notions with an emphasis on Hilbert's Nullstellensatz over an arbitrary field. A digression on Euclidian rings is followed by a thorough study of the arithmetic theory of cubic surfaces. Subsequent chapters are devoted to p-adic fields, the Hasse principle, and the subtle notion of Diophantine dimension of fields. All chapters contain exercises, with hints or complete solutions. Notes on Geometry and Arithmetic will appeal to a wide readership, ranging from graduate students through to researchers. Assuming only a basic background in abstract algebra and number theory, the text uses Diophantine questions to motivate readers seeking an accessible pathway into arithmetic geometry.

Geometric and Analytic Number Theory - Edmund Hlawka 2012-12-06

In the English edition, the chapter on the Geometry of Numbers has been enlarged to include the important findings of H. Lenstraj furthermore, tried and tested examples and exercises have been included. The translator, Prof. Charles Thomas, has solved the difficult problem of the German text into English in an admirable way. He deserves transferring our 'Unreserved praise and special thailks. Finally, we would like to express our gratitude to Springer-Verlag, for their commitment to the publication of this English edition, and for the special care taken in its production. Vienna, March 1991 E. Hlawka J. SchoiBengeier R. Taschner Preface to the German Edition We have set ourselves two aims with the present book on number theory. On the one hand for a reader who has

studied elementary number theory, and who has knowledge of analytic geometry, differential and integral calculus, together with the elements of complex variable theory, we wish to introduce basic results from the areas of the geometry of numbers, diophantine ap proximation, prime number theory, and the asymptotic calculation of number theoretic functions. However on the other hand for the student who has al ready studied analytic number theory, we also present results and principles of proof, which until now have barely if at all appeared in text books.

Diophantine Geometry - Marc Hindry 2013-12-01

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.

Model Theory : An Introduction - David Marker 2010-12-01

Assumes only a familiarity with algebra at the beginning graduate level; Stresses applications to algebra; Illustrates several of the ways Model Theory can be a useful tool in analyzing classical mathematical structures

The Symmetric Group - Bruce E. Sagan 2013-03-09

This book brings together many of the important results in this field. From the reviews: ""A classic gets even better....The edition has new material including the Novelli-Pak-Stoyanovskii bijective proof of the hook formula, Stanley's proof of the sum of squares formula using differential posets, Fomin's bijective proof of the sum of squares formula, group acting on posets and their use in proving unimodality, and chromatic symmetric functions." --ZENTRALBLATT MATH

Number Theory III - Serge Lang 1997-04-14

In 1988 Shafarevich asked me to write a volume for the Encyclopaedia of Mathematical

Sciences on Diophantine Geometry. I said yes, and here is the volume. By definition, diophantine problems concern the solutions of equations in integers, or rational numbers, or various generalizations, such as finitely generated rings over Z or finitely generated fields over Q. The word Geometry is tacked on to suggest geometric methods. This means that the present volume is not elementary. For a survey of some basic problems with a much more elementary approach, see [La 9Oc]. The field of diophantine geometry is now moving quite rapidly. Out standing conjectures ranging from decades back are being proved. I have tried to give the book some sort of coherence and permanence by em phasizing structural conjectures as much as results, so that one has a clear picture of the field. On the whole, I omit proofs, according to the boundary conditions of the encyclopedia. On some occasions I do give some ideas for the proofs when these are especially important. In any case, a lengthy bibliography refers to papers and books where proofs may be found. I have also followed Shafarevich's suggestion to give examples, and I have especially chosen these examples which show how some classical problems do or do not get solved by contemporary in sights. Fermat's last theorem occupies an intermediate position. Al though it is not proved, it is not an isolated problem any more.

Diophantine Approximation on Linear Algebraic Groups
Michel Waldschmidt
2013-03-14
The theory of transcendental numbers is closely related to the study of diophantine approximation. This book deals with values of the usual exponential function ez: a central open problem is the conjecture on algebraic independence of logarithms of algebraic numbers. Two chapters provide complete and simplified proofs of zero estimates (due to Philippon) on linear algebraic groups.

*Diophantine Analysi-s*Jorn

Steuding 2005-05-19
While its roots reach back to the third century, diophantine analysis continues to be an extremely active and powerful area of number theory. Many diophantine problems have simple formulations, they can be extremely difficult to attack, and many open problems and conjectures remain. Diophantine Analysis examines the theory of diophantine approximations and the theory of diophantine equations, with emphasis on interactions between these subjects. Beginning with the basic principles, the author develops his treatment around the theory of continued fractions and examines the classic theory, including some of its applications. He also explores modern topics rarely addressed in other texts, including the abc conjecture, the polynomial Pell equation, and the irrationality of the zeta function and touches on topics and applications related to discrete mathematics, such as factoring methods for large integers. Setting the stage for tackling the field's many open problems and conjectures, Diophantine Analysis is an ideal introduction to the fundamentals of this venerable but still dynamic field. A detailed appendix supplies the necessary background material, more than 200 exercises reinforce the concepts, and engaging historical notes bring the subject to life.

Diophantine Analysis - Jörn Steuding 2016-12-21
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 Bujačić 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.

An Introduction to the Geometry of Numbers - J.W.S. Cassels 2012-12-06

From the reviews: "A well-written, very thorough account ... Among the topics are lattices, reduction, Minkowskis Theorem, distance functions, packings, and automorphs; some applications to number theory; excellent bibliographical references." The American Mathematical Monthly

A Course in Functional Analysis - John B Conway 2019-03-09

This book is an introductory text in functional analysis. Unlike many modern treatments, it begins with the particular and works its way to the more general. From the reviews: "This book is an excellent text for a first graduate course in functional analysis....Many interesting and important applications are included....It includes an abundance of exercises, and is written in the engaging and lucid style which we have come to expect from the author." -- MATHEMATICAL REVIEWS

Algebraic Geometry - Richard Thomas 2018-06-01

This is Part 2 of a two-volume set. Since Oscar Zariski organized a meeting in 1954, there has been a major algebraic geometry meeting every decade: Woods Hole (1964), Arcata (1974), Bowdoin (1985), Santa Cruz (1995), and Seattle (2005). The American Mathematical Society has supported these summer institutes for over 50 years. Their proceedings volumes have been extremely influential, summarizing the

state of algebraic geometry at the time and pointing to future developments. The most recent Summer Institute in Algebraic Geometry was held July 2015 at the University of Utah in Salt Lake City, sponsored by the AMS with the collaboration of the Clay Mathematics Institute. This volume includes surveys growing out of plenary lectures and seminar talks during the meeting. Some present a broad overview of their topics, while others develop a distinctive perspective on an emerging topic. Topics span both complex algebraic geometry and arithmetic questions, specifically, analytic techniques, enumerative geometry, moduli theory, derived categories, birational geometry, tropical geometry, Diophantine questions, geometric representation theory, characteristic and -adic tools, etc. The resulting articles will be important references in these areas for years to come.

A First Course in Calculus Serge Lang 2012-09-17

This fifth edition of Lang's book covers all the topics traditionally taught in the first-year calculus sequence. Divided into five parts, each section of A FIRST COURSE IN CALCULUS contains examples and applications relating to the topic covered. In addition, the rear of the book contains detailed solutions to a large number of the exercises, allowing them to be used as worked-out examples -- one of the main improvements over previous editions.

The Mordell Conjecture - Hideaki Ikoma 2022-02-03

The Mordell conjecture (Faltings's theorem) is one of the most important achievements in Diophantine geometry, stating that an algebraic curve of genus at least two has only finitely many rational points. This book provides a self-contained and detailed proof of the Mordell conjecture following the papers of Bombieri and Vojta. Also acting as a concise introduction to Diophantine geometry, the text starts from basics of algebraic number theory, touches on several

important theorems and techniques (including the theory of heights, the Mordell–Weil theorem, Siegel's lemma and Roth's lemma) from Diophantine geometry, and culminates in the proof of the Mordell conjecture. Based on the authors' own teaching experience, it will be of great value to advanced undergraduate and graduate students in algebraic geometry and number theory, as well as researchers interested in Diophantine geometry as a whole.

Short Calculus - Serge Lang 2012-12-06

From the reviews "This is a reprint of the original edition of Lang's 'A First Course in Calculus', which was first published in 1964....The treatment is 'as rigorous as any mathematician would wish it'....[The exercises] are refreshingly simply stated, without any extraneous verbiage, and at times quite challenging....There are answers to all the exercises set and some supplementary problems on each topic to tax even the most able." -- Mathematical Gazette

The Arithmetic of Dynamical Systems - J.H. Silverman 2010-05-05

This book provides an introduction to the relatively new discipline of arithmetic dynamics. Whereas classical discrete dynamics is the study of iteration of self-maps of the complex plane or real line, arithmetic dynamics is the study of the number-theoretic properties of rational and algebraic points under repeated application of a polynomial or rational function. A principal theme of arithmetic dynamics is that many of the fundamental problems in the theory of Diophantine equations have dynamical analogs.This graduate-level text provides an entry for students into an active field of research and serves as a standard reference for researchers.

Model Theory, Algebra, and Geometry - Deirdre Haskell 2000-07-03

Model theory has made substantial contributions to

semialgebraic, subanalytic, p-adic, rigid and diophantine geometry. These applications range from a proof of the rationality of certain Poincare series associated to varieties over p-adic fields, to a proof of the Mordell-Lang conjecture for function fields in positive characteristic. In some cases (such as the latter) it is the most abstract aspects of model theory which are relevant. This book, originally published in 2000, arising from a series of introductory lectures for graduate students, provides the necessary background to understanding both the model theory and the mathematics behind these applications. The book is unique in that the whole spectrum of contemporary model theory (stability, simplicity, o-minimality and variations) is covered and diverse areas of geometry (algebraic, diophantine, real analytic, p-adic, and rigid) are introduced and discussed, all by leading experts in their fields.

Fundamentals of Diophantine Geometry - S. Lang 2013-06-29

Diophantine problems represent some of the strongest aesthetic attractions to algebraic geometry. They consist in giving criteria for the existence of solutions of algebraic equations in rings and fields, and eventually for the number of such solutions. The fundamental ring of interest is the ring of ordinary integers Z, and the fundamental field of interest is the field Q of rational numbers. One discovers rapidly that to have all the technical freedom needed in handling general problems, one must consider rings and fields of finite type over the integers and rationals. Furthermore, one is led to consider also finite fields, p-adic fields (including the real and complex numbers) as representing a localization of the problems under consideration. We shall deal with global problems, all of which will be of a qualitative nature. On the one hand we have curves defined over say the rational numbers. Ifthe curve is affine one may ask for

its points in Z, and thanks to Siegel, one can classify all curves which have infinitely many integral points. This problem is treated in Chapter VII. One may ask also for those which have infinitely many rational points, and for this, there is only Mordell's conjecture that if the genus is :;;; 2, then there is only a finite number of rational points.

Arakelov Geometry and Diophantine Applications - Emmanuel Peyre 2021-03-11

Bridging the gap between novice and expert, the aim of this book is to present in a self-contained way a number of striking examples of current diophantine problems to which Arakelov geometry has been or may be applied. Arakelov geometry can be seen as a link between algebraic geometry and diophantine geometry. Based on lectures from a summer school for graduate students, this volume consists of 12 different chapters, each written by a different author. The first chapters provide some background and introduction to the subject. These are followed by a presentation of different applications to arithmetic geometry. The final part describes the recent application of Arakelov geometry to Shimura varieties and the proof of an averaged version of Colmez's conjecture. This book thus blends initiation to fundamental tools of Arakelov geometry with original material corresponding to current research. This book will be particularly useful for graduate students and researchers interested in the connections between algebraic geometry and number theory. The prerequisites are some knowledge of number theory and algebraic geometry.

Heights in Diophantine Geometry - Enrico Bombieri 2007-09-06

This monograph is a bridge between the classical theory and modern approach via arithmetic geometry.

Algebra, Logic and Combinatorics- Shaun Bullett 2016-04-21

This book leads readers from a basic foundation to an advanced level understanding

of algebra, logic and combinatorics. Perfect for graduate or PhD mathematical-science students looking for help in understanding the fundamentals of the topic, it also explores more specific areas such as invariant theory of finite groups, model theory, and enumerative combinatorics. Algebra, Logic and Combinatorics is the third volume of the LTCC Advanced Mathematics Series. This series is the first to provide advanced introductions to mathematical science topics to advanced students of mathematics. Edited by the three joint heads of the London Taught Course Centre for PhD Students in the Mathematical Sciences (LTCC), each book supports readers in broadening their mathematical knowledge outside of their immediate research disciplines while also covering specialized key areas. Contents:Enumerative Combinatorics (Peter J Cameron)Introduction to the Finite Simple Groups (Robert A Wilson)Introduction to Representations of Algebras and Quivers (Anton Cox)The Invariant Theory of Finite Groups (Peter Fleischmann and James Shank)Model Theory (Ivan Tomašić) Readership: Researchers, graduate or PhD mathematical-science students who require a reference book that covers algebra, logic or combinatorics.

Tropical and Non-Archimedean Geometry - Omid Amini 2014-12-26

Over the past decade, it has become apparent that tropical geometry and non-Archimedean geometry should be studied in tandem; each subject has a great deal to say about the other. This volume is a collection of articles dedicated to one or both of these disciplines. Some of the articles are based, at least in part, on the authors' lectures at the 2011 Bellairs Workshop in Number Theory, held from May 6-13, 2011, at the Bellairs Research Institute, Holetown, Barbados. Lecture topics covered in this volume include polyhedral structures on tropical varieties, the structure theory of non-Archimedean

curves (algebraic, analytic, tropical, and formal), uniformisation theory for non-Archimedean curves and abelian varieties, and applications to Diophantine geometry. Additional articles selected for inclusion in this volume represent other facets of current research and illuminate connections between tropical geometry, non-Archimedean geometry, toric geometry, algebraic graph theory, and algorithmic aspects of systems of polynomial equations.

Rational Points on Elliptic Curves - Joseph H. Silverman 2013-04-17

The theory of elliptic curves involves a blend of algebra, geometry, analysis, and number theory. This book stresses this interplay as it develops the basic theory, providing an opportunity for readers to appreciate the unity of modern mathematics. The book's accessibility, the informal writing style, and a wealth of exercises make it an ideal introduction for those interested in learning about Diophantine equations and arithmetic geometry.

Analysis and Probability - Palle E. T. Jorgensen 2007-10-17

Combines analysis and tools from probability, harmonic analysis, operator theory, and engineering (signal/image processing) Interdisciplinary focus with hands-on approach, generous motivation and new pedagogical techniques Numerous exercises reinforce fundamental concepts and hone computational skills Separate sections explain engineering terms to mathematicians and operator theory to engineers Fills a gap in the literature

A Pythagorean Introduction to Number Theory - Ramin Takloo-Bighash 2019-01-12

Right triangles are at the heart of this textbook's vibrant new approach to elementary number theory. Inspired by the familiar Pythagorean theorem, the author invites the reader to ask natural arithmetic questions about right triangles, then proceeds to develop the theory needed to respond. Throughout, students are

encouraged to engage with the material by posing questions, working through exercises, using technology, and learning about the broader context in which ideas developed. Progressing from the fundamentals of number theory through to Gauss sums and quadratic reciprocity, the first part of this text presents an innovative first course in elementary number theory. The advanced topics that follow, such as counting lattice points and the four squares theorem, offer a variety of options for extension, or a higher-level course; the breadth and modularity of the later material is ideal for creating a senior capstone course. Numerous exercises are included throughout, many of which are designed for SageMath. By involving students in the active process of inquiry and investigation, this textbook imbues the foundations of number theory with insights into the lively mathematical process that continues to advance the field today. Experience writing proofs is the only formal prerequisite for the book, while a background in basic real analysis will enrich the reader's appreciation of the final chapters.

A First Course in Noncommutative Rings - Tsit-Yuen Lam 2001-06-21

Aimed at the novice rather than the connoisseur and stressing the role of examples and motivation, this text is suitable not only for use in a graduate course, but also for self-study in the subject by interested graduate students. More than 400 exercises testing the understanding of the general theory in the text are included in this new edition.

Arakelov Geometry and Diophantine Applications Emmanuel Peyre 2021-03-10

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between algebraic geometry and diophantine geometry. Based on lectures from a summer school for graduate students, this volume consists of 12 different chapters, each written by a different author. The first chapters provide some background and introduction to the subject. These are followed by a presentation of different applications to arithmetic geometry. The final part describes the recent application of Arakelov geometry to Shimura varieties and the proof of an averaged version of Colmez's conjecture. This book thus blends initiation to fundamental tools of Arakelov geometry with original material corresponding to current research. This book will be particularly useful for graduate students and researchers interested in the connections between algebraic geometry and number theory. The prerequisites are some knowledge of number theory and algebraic geometry.

Introduction to Algebraic Geometry - Serge Lang 2019-03-20

Rapid, concise, self-contained introduction assumes only familiarity with elementary algebra. Subjects include algebraic varieties; products, projections, and correspondences; normal varieties; differential forms; theory of simple points; algebraic groups; more. 1958 edition.

Fundamentals of Differential Geometry - Serge Lang 2012-12-06

This book provides an introduction to the basic concepts in differential topology, differential geometry, and differential equations, and some of the main basic theorems in all three areas. This new edition includes new chapters, sections, examples, and exercises. From the reviews: "There are many books on the fundamentals of differential geometry, but this one is quite exceptional; this is not surprising for those who know Serge Lang's books." -- EMS NEWSLETTER

Fundamentals of Diophantine Geometry - S. Lang 1983-08-29

Diophantine problems represent some of the strongest aesthetic attractions to algebraic geometry. They consist in giving criteria for the existence of solutions of algebraic equations in rings and fields, and eventually for the number of such solutions. The fundamental ring of interest is the ring of ordinary integers Z, and the fundamental field of interest is the field Q of rational numbers. One discovers rapidly that to have all the technical freedom needed in handling general problems, one must consider rings and fields of finite type over the integers and rationals. Furthermore, one is led to consider also finite fields, p-adic fields (including the real and complex numbers) as representing a localization of the problems under consideration. We shall deal with global problems, all of which will be of a qualitative nature. On the one hand we have curves defined over say the rational numbers. Ifthe curve is affine one may ask for its points in Z, and thanks to Siegel, one can classify all curves which have infinitely many integral points. This problem is treated in Chapter VII. One may ask also for those which have infinitely many rational points, and for this, there is only Mordell's conjecture that if the genus is :;;; 2, then there is only a finite number of rational points.

Advanced Topics in the Arithmetic of Elliptic Curves

Joseph H. Silverman

2013-12-01

In the introduction to the first volume of The Arithmetic of Elliptic Curves (Springer-Verlag, 1986), I observed that "the theory of elliptic curves is rich, varied, and amazingly vast," and as a consequence, "many important topics had to be omitted." I included a brief introduction to ten additional topics as an appendix to the first volume, with the tacit understanding that eventually there might be a second volume containing the details. You are now holding that second volume. it turned out that even those ten topics would not fit Unfortunately,

into a single book, so I was forced to make some choices. The following material is covered in this book: I. Elliptic and modular functions for the full modular group. II. Elliptic curves with complex multiplication. III. Elliptic surfaces and specialization theorems. IV. Neron models, Kodaira-Neron classification of special fibers, Tate's algorithm, and Ogg's conductor-discriminant formula. V. Tate's theory of q-curves over p-adic fields. VI. Neron's theory of canonical local height functions.

On Finiteness in Differential Equations and Diophantine Geometry - Dana Schlomiuk

This book focuses on finiteness conjectures and results in ordinary differential equations (ODEs) and Diophantine geometry. During the past twenty-five years, much progress has been achieved on finiteness conjectures, which are the offspring of the second part of Hilbert's 16th problem. Even in its simplest case, this is one of the very few problems on Hilbert's list which remains unsolved. These results are about existence and estimation of finite bounds for the number of limit cycles occurring in certain families of ODEs. The book describes this progress, the methods used (bifurcation theory, asymptotic expansions, methods of differential algebra, or geometry) and the specific results obtained. The finiteness conjectures on limit cycles are part of a larger picture that also includes finiteness problems in other areas of mathematics, in particular those in Diophantine geometry where remarkable results were proved during the same period of time. There is a chapter devoted to finiteness results in D The volume can be used as an independent study text for advanced undergraduates and graduate students studying ODEs or applications of differential algebra to differential equations and Diophantine geometry. It is also is a good entry point for researchers interested these areas, in particular, in limit cycles of ODEs, and in finiteness problems.

Contributors to the volume include Andrey Bolibrukh and Alexandru Buium. Available from the AMS by A. Buium is Arithmetic Differential Equations, as Volume 118 in the Mathematical Surveys and Monographs series.

Logarithmic Forms and Diophantine Geometry - A. Baker 2008-01-17

There is now much interplay between studies on logarithmic forms and deep aspects of arithmetic algebraic geometry. New light has been shed, for instance, on the famous conjectures of Tate and Shafarevich relating to abelian varieties and the associated celebrated discoveries of Faltings establishing the Mordell conjecture. This book gives an account of the theory of linear forms in the logarithms of algebraic numbers with special emphasis on the important developments of the past twenty-five years. The first part covers basic material in transcendental number theory but with a modern perspective. The remainder assumes some background in Lie algebras and group varieties, and covers, in some instances for the first time in book form, several advanced topics. The final chapter summarises other aspects of Diophantine geometry including hypergeometric theory and the André-Oort conjecture. A comprehensive bibliography rounds off this definitive survey of effective methods in Diophantine geometry.