Basic Algebraic Geometry 1 Varieties In Projective Space

Ruled varieties are unions of a family of linear spaces. They are objects of algebraic geometry as well as differential geometry, especially if the ruling is developable. This book is an introduction to both aspects, the algebraic and differential one. Starting from very elementary facts, the necessary techniques are developed, especially concerning Grassmannians and fundamental forms in a version suitable for complex projective algebraic geometry. Finally, this leads to recent results on the classification of developable ruled varieties and facts about tangent and secant varieties. Compared to many other topics of algebraic geometry, this is an area easily accessible to a graduate course.

Aimed primarily at graduate students and beginning researchers, this book provides an introduction to algebraic geometry that is particularly suitable for those with no previous contact with the subject; it assumes only the standard background of undergraduate algebra. The book starts with easily-formulated problems with non-trivial solutions and uses these problems to introduce the fundamental tools of modern algebraic geometry: dimension; singularities; sheaves; varieties; and cohomology. A range of exercises is provided for each topic discussed, and a selection of problems and exam papers are collected in an appendix to provide material for further study.

A comprehensive, self-contained treatment presenting general results of the theory. Establishes a geometric intuition and a working facility with specific geometric practices. Emphasizes applications through the study of interesting examples and the development of computational tools. Coverage ranges from analytic to geometric. Treats basic techniques and results of complex manifold theory, focusing on results applicable to projective varieties, and includes discussion of the theory of Riemann surfaces and algebraic curves, algebraic surfaces and the quadric line complex as well as special topics in complex manifolds.

The classification theory of algebraic varieties is the focus of this book. This very active area of research is still developing, but an amazing quantity of knowledge has accumulated over the past twenty years. The authors goal is to provide an easily accessible introduction to the subject. The book starts with preparatory and standard definitions and results, then moves on to discuss various aspects of the geometry of smooth projective varieties with many rational curves, and finishes in taking the first steps towards Moris minimal model program of classification of algebraic varieties by proving the cone and contraction theorems. The book is well-organized and the author has kept the number of concepts that are used but not proved to a minimum to provide a mostly self-contained introduction.

An illustration of the many uses of algebraic geometry, highlighting the more recent applications of Groebner bases and resultants. Along the way, the authors provide an introduction to some algebraic objects and techniques more advanced than typically encountered in a first course. The book is accessible to non-specialists and to readers with a diverse range of backgrounds, assuming readers know the material covered in standard undergraduate courses, including abstract algebra. But because the text is intended for beginning graduate students, it does not require graduate algebra, and in particular, does not assume that the reader is familiar with modules.

This two-part EMS volume provides a succinct summary of complex algebraic geometry, coupled with a lucid introduction to the recent work on the interactions between the classical area of the geometry of complex algebraic curves and their Jacobian varieties. An excellent companion to the older classics on the subject.

An introduction to the theory of algebraic functions on varieties from a sheaf theoretic standpoint.

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.

This book is a collection of articles on Abelian varieties and number theory dedicated to Gerhard Frey's 75th birthday. It contains original articles by experts in the area of arithmetic and algebraic geometry. The articles cover topics on Abelian varieties and finitely generated Galois groups, ranks of Abelian varieties and Mordell-Lang conjecture, Tate-Shafarevich group and isogeny volcanoes, endomorphisms of superelliptic Jacobians, obstructions to local-global principles over semi-global fields, Drinfeld modular varieties, representations of etale fundamental groups and specialization of algebraic cycles, Deuring's theory of constant reductions, etc. The book will be a valuable resource to graduate students and experts working on Abelian varieties and related areas.

This short and readable introduction to algebraic geometry will be ideal for all undergraduate mathematicians coming to the subject for the first time.

Toric varieties form a beautiful and accessible part of modern algebraic geometry. This book covers the standard topics in toric geometry; a novel feature is that each of the first nine chapters contains an introductory section on the necessary background material in algebraic geometry. Other topics covered include quotient constructions, vanishing theorems, equivariant cohomology, GIT quotients, the secondary fan, and the minimal model program for toric varieties. The subject lends itself to rich examples reflected in the 134 illustrations included in the text. The book also explores connections with commutative algebra and polyhedral geometry, treating both polytopes and their unbounded cousins, polyhedra. There are appendices on the history of toric varieties and the computational tools available to investigate nontrivial examples in toric geometry. Readers of this book should be familiar with the material covered in basic graduate courses in algebra and topology, and to a somewhat lesser degree, complex analysis. In addition, the authors assume that the reader has had some previous experience with algebraic geometry at an advanced undergraduate level. The book will be a useful reference for graduate students and researchers who are interested in algebraic geometry, polyhedral geometry, and toric varieties.

This introduction to algebraic geometry allows readers to grasp the fundamentals of the subject with only linear algebra and calculus as prerequisites. After a brief history of the subject, the book introduces projective spaces and projective varieties, and explains plane curves and resolution of their singularities. The volume further develops the geometry of algebraic curves and treats congruence zeta functions of algebraic curves over a finite field. It concludes with a complex analytical discussion of algebraic curves. The author emphasizes computation of concrete examples rather than proofs, and these examples are discussed from various viewpoints. This approach allows readers to develop a deeper understanding of the theorems.

This is a relatively fast paced graduate level introduction to complex algebraic geometry, from the basics to the frontier of the subject. It covers sheaf theory, cohomology, some Hodge theory, as well as some of the more algebraic aspects of algebraic geometry. The author frequently refers the reader if the treatment of a certain topic is readily available elsewhere but goes into considerable detail on topics for which his treatment puts a twist or a more transparent viewpoint. His cases of exploration and are chosen very carefully and deliberately. The textbook achieves its purpose of taking new students of complex algebraic geometry through this a deep yet broad introduction to a vast subject, eventually bringing them to the forefront of the topic via a non-intimidating style.

This is a description of the underlying principles of algebraic geometry, some of its important developments in the twentieth century, and some of the problems that occupy its practitioners today. It is intended for the working or the aspiring mathematician who is unfamiliar with algebraic geometry but wishes to gain an appreciation of its foundations and its goals with a minimum of prerequisites. Few algebraic prerequisites are presumed beyond a basic course in linear algebra.

An introduction to abstract algebraic geometry, with the only prerequisites being results from commutative algebra, which are stated as needed, and some elementary topology. More than 400 exercises distributed throughout the book offer specific examples as well as more specialised topics not treated in the main text, while three appendices present brief accounts of some areas of current research. This book can thus be used as textbook for an introductory course in algebraic geometry following a basic graduate course in algebra. Robin Hartshorne studied algebraic geometry with Oscar Zariski and David Mumford at Harvard, and with J.-P. Serre and A. Grothendieck in Paris. He is the author of "Residues and Duality", "Foundations of Projective Geometry", "Ample Subvarieties of Algebraic Varieties", and numerous research titles.

The second volume of Shafarevich's introductory book on algebraic geometry focuses on schemes, complex algebraic varieties and complex manifolds. As with first volume the author has revised the text and added new material. Although the material is more advanced than in Volume 1 the algebraic apparatus is kept to a minimum making the book accessible to non-specialists. It can be read independently of the first volume and is suitable for beginning graduate students.

This book provides an overview of the latest progress on rationality questions in algebraic geometry. It discusses new developments such as universal triviality of the Chow group of zero cycles, various aspects of stable birationality, cubic and Fano fourfolds, rationality of moduli spaces and birational invariants of group actions on varieties, contributed by the foremost experts in their fields. The question of whether an algebraic variety can be parametrized by rational functions of as many variables as its dimension has a long history and played an important role in the history of algebraic geometry. Recent developments in algebraic geometry have made this question again a focal point of research and formed the impetus to organize a conference in the series of conferences on the island of Schiermonnikoog. The book follows in the tradition of earlier volumes, which originated from conferences on the islands Texel and Schiermonnikoog.

This book is a revised and expanded new edition of the first four chapters of Shafarevich’s well-known introductory book on algebraic geometry. Besides correcting misprints and inaccuracies, the author has added plenty of new material, mostly concrete geometrical material such as Grassmannian varieties, plane cubic curves, the cubic surface, degenerations of quadrics and elliptic curves, the Bertini theorems, and normal surface singularities.

This book and the following second volume is an introduction into modern algebraic geometry. In the first volume the methods of homological algebra, theory of sheaves, and sheaf cohomology are developed. These methods are indispensable for modern algebraic geometry, but they are also fundamental for other branches of mathematics and of great interest in their own. In the last chapter of volume I these concepts are applied to the theory of compact Riemann surfaces. In this chapter the author makes clear how influential the ideas of Abel, Riemann and Jacobi were and that many of the modern methods have been anticipated by them.

Basic Algebraic Geometry 1Varieties in Projective SpaceSpringer

Mumford's famous "Red Book" gives a simple, readable account of the basic objects of algebraic geometry, preserving as much as possible their geometric flavor and integrating this with the tools of commutative algebra. It is aimed at graduates or mathematicians in other fields wishing to quickly learn aboutalgebraic geometry. This new edition includes an appendix that gives an overview of the theory of curves, their moduli spaces and their Jacobians -- one of the most exciting fields within algebraic geometry.

Algebraic Geometry has been at the center of much of mathematics for hundreds of years. It is not an easy field to break into, despite its humble beginnings in the study of circles, ellipses, hyperbolas, and parabolas. This text consists of a series of ex

"... To sum up, this book helps to learn algebraic geometry in a short time, its concrete style is enjoyable for students and reveals the beauty of mathematics." --Acta Scientiarum Mathematicarum

Algebraic Geometry and Commutative Algebra in Honor of Masayoshi Nagata presents a collection of papers on algebraic geometry and commutative algebra in honor of Masayoshi Nagata for his significant contributions to commutative algebra. Topics covered range from power series rings and rings of invariants of finite linear groups to the convolution algebra of distributions on totally disconnected locally compact groups. The discussion begins with a description of several formulas for enumerating certain types of objects, which may be tabular arrangements of integers called Young tableaux or some types of monomials. The next chapter explains how to establish these enumerative formulas, with emphasis on the role played by transformations of determinantal polynomials and recurrence relations satisfied by them. The book then turns to several applications of the enumerative formulas and universal identity, including including enumerative proofs of the straightening law of Doubilet-Rota-Stein and computations of Hilbert functions of polynomial ideals of certain determinantal loci. Invariant differentials and quaternion extensions are also examined, along with the moduli of Todorov surfaces and the classification problem of embedded lines in characteristic p. This monograph will be a useful resource for practitioners and researchers in algebra and geometry.

This two-part volume contains numerous examples and insights on various topics. The authors have taken pains to present the material rigorously and coherently. This book will be immensely useful to mathematicians and graduate students working in algebraic geometry, arithmetic algebraic geometry, complex analysis and related fields.

Shafarevich's Basic Algebraic Geometry has been a classic and universally used introduction to the subject since its first appearance over 40 years ago. As the translator writes in a prefatory note, ``For all [advanced undergraduate and beginning graduate] students, and for the many specialists in other branches of math who need a liberal education in algebraic geometry, Shafarevich’s book is a must.'' The third edition, in addition to some minor corrections, now offers a new treatment of the Riemann--Roch theorem for curves, including a proof from first principles. Shafarevich's book is an attractive and accessible introduction to algebraic geometry, suitable for beginning students and nonspecialists, and the new edition is set to remain a popular introduction to the field.

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This book introduces the reader to modern algebraic geometry. It presents Grothendieck's technically demanding language of schemes that is the basis of the most important developments in the last fifty years within this area. A systematic treatment and motivation of the theory is emphasized, using concrete examples to illustrate its usefulness. Several examples from the realm of Hilbert modular surfaces and of determinantal varieties are used methodically to discuss the covered techniques. Thus the reader experiences that the further development of the theory yields an ever better understanding of these fascinating objects. The text is complemented by many exercises that serve to check the comprehension of the text, treat further examples, or give an outlook on further results. The volume at hand is an introduction to schemes. To get startet, it requires only basic knowledge in abstract algebra and topology. Essential facts from commutative algebra are assembled in an appendix. It will be complemented by a second volume on the cohomology of schemes.

This book is a general introduction to the theory of schemes, followed by applications to arithmetic surfaces and to the theory of reduction of algebraic curves. The first part introduces basic objects such as schemes, morphisms, base change, local properties (normality, regularity, Zariski's Main Theorem). This is followed by the more global aspect: coherent sheaves and a finiteness theorem for their cohomology groups. Then follows a chapter on sheaves of differentials, dualizing sheaves, and Grothendieck's duality theory. The first part ends with the theorem of Riemann-Roch and its application to the study of smooth projective curves over a field. Singular curves are treated through a detailed study of the Picard group. The second part starts with blowing-ups and desingularisation (embedded or not) of fibered surfaces over a Dedekind ring that leads on to intersection theory on arithmetic surfaces. Castelnuovo's criterion is proved and also the existence of the minimal regular model. This leads to the study of reduction of algebraic curves. The case of elliptic curves is studied in detail. The book concludes with the funadmental theorem of stable reduction of Deligne-Mumford. The book is essentially self-contained, including the necessary material on commutative algebra. The prerequisites are therefore few, and the book should suit a graduate student. It contains many examples and nearly 600 exercises.

This book is a true introduction to the basic concepts and techniques of algebraic geometry. The language is purposefully kept on an elementary level, avoiding sheaf theory and cohomology theory. The introduction of new algebraic concepts is always motivated by a discussion of the corresponding geometric ideas. The main point of the book is to illustrate the interplay between abstract theory and specific examples. The book contains numerous problems that illustrate the general theory. The text is suitable for advanced undergraduates and beginning graduate students. It contains sufficient material for a one-semester course. The reader should be familiar with the basic concepts of modern algebra. A course in one complex variable would be helpful, but is not necessary.

"This book succeeds brilliantly by concentrating on a number of core topics...and by treating them in a hugely rich and varied way. The author ensures that the reader will learn a large amount of classical material and perhaps more importantly, will also learn that there is no one approach to the subject. The essence lies in the range and interplay of possible approaches. The author is to be congratulated on a work of deep and enthusiastic scholarship." --MATHEMATICAL REVIEWS

Beginning algebraic geometers are well served by Uneno's inviting introduction to the language of schemes. Grothendieck's schemes and Zariski's emphasis on algebra and rigor are primary sources for this introduction to a rich mathematical subject. Ueno's book is a self-contained text suitable for an introductory course on algebraic geometry.

Algebraic geometry has always been an ec1ectic science, with its roots in algebra, function-theory and topology. Apart from early resear ches, now about a century old, this beautiful branch of mathematics has for many years been investigated chiefly by the Italian school which, by its pioneer work, based on algebro-geometric methods, has succeeded in building up an imposing body of knowledge. Quite apart from its intrinsic interest, this possesses high heuristic value since it represents an essential step towards the modern achievements. A certain lack of rigour in the c1assical methods, especially with regard to the foundations, is largely justified by the creative impulse revealed in the first stages of our subject; the same phenomenon can be observed, to a greater or less extent, in the historical development of any other science, mathematical or non-mathematical. In any case, within the c1assical domain itself, the foundations were later explored and consolidated, principally by SEVERI, on lines which have frequently inspired further investigations in the abstract field. About twenty-five years ago B. L. VAN DER WAERDEN and, later, O. ZARISKI and A. WEIL, together with their schools, established the methods of modern abstract algebraic geometry which, rejecting the c1assical restriction to the complex groundfield, gave up geometrical intuition and undertook arithmetisation under the growing influence of abstract algebra.

From the reviews: "Although several textbooks on modern algebraic geometry have been published in the meantime, Mumford's "Volume I" is, together with its predecessor the red book of varieties and schemes, now as before one of the most excellent and profound primers of modern algebraic geometry. Both books are just true classics!" Zentralblatt

The second volume of Shafarevich's introductory book on algebraic geometry focuses on schemes, complex algebraic varieties and complex manifolds. As with Volume 1 the author has revised the text and added new material, e.g. a section on real algebraic curves. Although the material is more advanced than in Volume 1 the algebraic apparatus is kept to a minimum making the book accessible to non-specialists. It can be read independently of Volume 1 and is suitable for beginning graduate students in mathematics as well as in theoretical physics.

This book can form the basis of a second course in algebraic geometry. As motivation, it takes concrete questions from enumerative geometry and intersection theory, and provides intuition and technique, so that the student develops the ability to solve geometric problems. The authors explain key ideas, including rational equivalence, Chow rings, Schubert calculus and Chern classes, and readers will appreciate the abundant examples, many provided as exercises with solutions available online. Intersection is concerned with the enumeration of solutions of systems of polynomial equations in several variables. It has been an active area of mathematics since the work of Leibniz. Chasles' nineteenth-century calculation that there are 3264 smooth conic plane curves tangent to five given general conics was an important landmark, and was the inspiration behind the title of this book. Such computations were motivation for Poincaré's development of topology, and for many subsequent theories, so that intersection theory is now a central topic of modern mathematics.