An Algebraic Introduction To Complex Projective Geometry Commutative Algebra Cambridge Studies In Advanced Mathematics

This text is part of the International Series in Pure and Applied Mathematics. It is designed for junior, senior, and first-year graduate students in mathematics and engineering. This edition preserves the basic content and style of earlier editions and includes many new and relevant applications which are introduced early in the text. Topics include complex numbers, analytic functions, elementary functions, and integrals.

An elementary account of many aspects of classical complex function theory, including Mobius transformations, elliptic functions, Riemann surfaces, Fuchsian groups and modular functions. The book is based on lectures given to advanced undergraduate students and is well suited as a textbook for a second course in complex function theory.

The articles in this volume cover some developments in complex analysis and algebraic geometry. The book is divided into three parts. Part I includes topics in the theory of algebraic surfaces and analytic surface. Part II covers topics in moduli and classification problems, as well as structure theory of certain complex manifolds. Part III is devoted to various topics in algebraic geometry analysis and arithmetic. A survey article by Ueno serves as an introduction to the general background of the subject matter of the volume. The volume was written for Kunihiko Kodaira on the occasion of his sixtieth birthday, by his friends and students. Professor Kodaira was one of the world's leading mathematicians in algebraic geometry and complex manifold theory: and the contributions reflect those concerns.

All needed notions are developed within the book: with the exception of fundamentals which are presented in introductory lectures, no other knowledge is assumed Provides a more in-depth introduction to the subject than other existing books in this area Over 400 exercises including hints for solutions are included

The 2003 second volume of this account of Kaehlerian geometry and Hodge theory starts with the topology of families of algebraic varieties. Proofs of the Lefschetz theorem on hyperplane sections, the Picard–Lefschetz study of Lefschetz pencils, and Deligne theorems on the degeneration of the Leray spectral sequence and the global invariant cycles follow. The main results of the second part are the generalized Noether–Lefschetz theorems, the generic triviality of the Abel–Jacobi maps, and most importantly Nori's connectivity theorem, which generalizes the above. The last part of the book is devoted to the relationships between Hodge theory and algebraic cycles. The book concludes with the example of cycles on abelian varieties, where some results of Bloch and Beauville, for example, are expounded. The text is complemented by exercises giving useful results in complex algebraic geometry. It will be welcomed by researchers in both algebraic and differential geometry.

This book is a basic reference in the modern theory of holomorphic foliations, presenting the interplay between various aspects of the theory and utilizing methods from algebraic and complex geometry along with techniques from complex dynamics and several complex variables. The result is a solid introduction to the theory of foliations, covering basic concepts through modern results on the structure of foliations on complex projective spaces.

Illuminating, widely praised book on analytic geometry of circles, the Moebius transformation, and 2-dimensional non-Euclidean geometries.

This is an introductory textbook designed for undergraduate mathematics majors with an emphasis on abstraction and in particular, the concept of proofs in the setting of linear algebra. Typically such a student would have taken calculus, though the only prerequisite is suitable mathematical grounding. The purpose of this book is to bridge the gap between the more conceptual and computational oriented undergraduate classes to the more abstract oriented classes. The book begins with systems of linear equations and complex numbers, then relates these to the abstract notion of linear maps on finite-dimensional vector spaces, and covers diagonalization, eigenspaces, determinants, and the Spectral Theorem. Each chapter concludes with both proof-writing and computational exercises.

From the reviews: "... In sum, the volume under review is the first quarter of an important work that surveys an active branch of modern mathematics. Some of the individual articles are reminiscent in style of the early volumes of the first Ergebnisse series and will probably prove to be equally useful as a reference; ...for the appropriate reader, they will be valuable sources of information about modern complex analysis." Bulletin of the Am.Math.Society, 1991 "... This remarkable book has a helpfully informal style, abundant motivation, outlined proofs followed by precise references, and an extensive bibliography; it will be an invaluable reference and a companion to modern courses on several complex variables." ZAMP, Zeitschrift für Angewandte Mathematik und Physik, 1990

Excellent introductory text focuses on complex numbers, determinants, orthonormal bases, symmetric and hermitian matrices, first order non-linear equations, linear differential equations, Laplace transforms, Bessel functions, more. Includes 48 black-and-white illustrations. Exercises with solutions. Index.

The first of two volumes offering a modern introduction to Kaehlerian geometry and Hodge structure. The book starts with basic material on complex variables, complex manifolds, holomorphic vector bundles, sheaves and cohomology theory, the latter being treated in a more theoretical way than is usual in geometry. The author then proves the Kaehler identities, which leads to the hard Lefschetz theorem and the Hodge index theorem. The book culminates with the Hodge decomposition theorem. The meanings of these results are investigated in several directions. Completely self-contained, the book is ideal for students, while its content gives an account of Hodge theory and complex algebraic geometry as has been developed by P. Griffiths and his school, by P. Deligne, and by S. Bloch. The text is complemented by exercises which provide useful results in complex algebraic geometry.

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

This book offers a rigorous and coherent introduction to the five basic number systems

of mathematics, namely natural numbers, integers, rational numbers, real numbers, and complex numbers. It is a subject that many mathematicians believe should be learned by any student of mathematics including future teachers. The book starts with the development of Peano arithmetic in the first chapter which includes mathematical induction and elements of recursion theory. It proceeds to an examination of integers that also covers rings and ordered integral domains. The presentation of rational numbers includes material on ordered fields and convergence of sequences in these fields. Cauchy and Dedekind completeness properties of the field of real numbers are established, together with some properties of real continuous functions. An elementary proof of the Fundamental Theorem of Algebra is the highest point of the chapter on complex numbers. The great merit of the book lies in its extensive list of exercises following each chapter. These exercises are designed to assist the instructor and to enhance the learning experience of the students.
Pure Mathematics for Beginners Pure Mathematics for Beginners consists of a series of lessons in Logic, Set Theory, Abstract Algebra, Number Theory, Real Analysis, Topology, Complex Analysis, and Linear Algebra. The 16 lessons in this book cover basic through intermediate material from each of these 8 topics. In addition, all the proofwriting skills that are essential for advanced study in mathematics are covered and reviewed extensively. Pure Mathematics for Beginners is perfect for professors teaching an introductory college course in higher mathematics high school teachers

working with advanced math students students wishing to see the type of mathematics they would be exposed to as a math major. The material in this pure math book includes: 16 lessons in 8 subject areas. A problem set after each lesson arranged by difficulty level. A complete solution guide is included as a downloadable PDF file. Pure Math Book Table Of Contents (Selected) Here's a selection from the table of contents: Introduction Lesson 1 - Logic: Statements and Truth Lesson 2 - Set Theory: Sets and Subsets Lesson 3 - Abstract Algebra: Semigroups, Monoids, and Groups Lesson 4 - Number Theory: Ring of Integers Lesson 5 - Real Analysis: The Complete Ordered Field of Reals Lesson 6 - Topology: The Topology of R Lesson 7 - Complex Analysis: The field of Complex Numbers Lesson 8 - Linear Algebra: Vector Spaces Lesson 9 - Logic: Logical Arguments Lesson 10 - Set Theory: Relations and Functions Lesson 11 - Abstract Algebra: Structures and Homomorphisms Lesson 12 - Number Theory: Primes, GCD, and LCM Lesson 13 - Real Analysis: Limits and Continuity Lesson 14 - Topology: Spaces and Homeomorphisms Lesson 15 - Complex Analysis: Complex Valued Functions Lesson 16 - Linear Algebra: Linear Transformations

Geared toward readers unfamiliar with complex numbers, this text explains how to solve problems that frequently arise in the applied sciences and emphasizes constructions related to algebraic operations. 1956 edition.

A textbook for second-year graduate students who are familiar with algebraic topology, function theory, and elementary differential geometry. The collection of seminar notes constitutes an introduction to complex algebraic geometry, focusing on its transcendental aspect. Annotation copyright Book Ne

facts. An elementary acquaintance with topology, algebra, and analysis (in cluding the notion of a manifold) is sufficient as far as the understanding of this book is concerned. All the necessary properties and theorems have been gathered in the preliminary chapters -either with proofs or with references to standard and elementary textbooks. The first chapter of the book is devoted to a study of the rings Oa of holomorphic functions. The notions of analytic sets and germs are introduced in the second chapter. Its aim is to present elementary properties of these objects, also in connection with ideals of the rings Oa. The case of principal germs (§5) and one-dimensional germs (Puiseux theorem, §6) are treated separately. The main step towards understanding of the local structure of analytic sets is Ruckert's descriptive lemma proved in Chapter III. Among its conse quences is the important Hilbert Nullstellensatz (§4). In the fourth chapter, a study of local structure (normal triples, § 1) is followed by an exposition of the basic properties of analytic sets. The latter includes theorems on the set of singular points, irreducibility, and decom position into irreducible branches (§2). The role played by the ring 0 A of an analytic germ is shown (§4). Then, the Remmert-Stein theorem on re movable singularities is proved (§6). The last part of the chapter deals with analytically constructible sets (§7). Since the appearance of Kobayashi's book, there have been several re sults at the basic level of hyperbolic spaces, for instance Brody's theorem, and results of Green, Kiernan, Kobayashi, Noguchi, etc. which make it worthwhile to have a systematic exposition. Although of necessity I re produce some theorems from Kobayashi, I take a different direction, with different applications in mind, so the present book does not super sede Kobayashi's. My interest in these matters stems from their relations with diophan tine geometry. Indeed, if X is a projective variety over the complex numbers, then I conjecture that X is hyperbolic if and only if X has only a finite number of rational points in every finitely generated field over the rational numbers. There are also a number of subsidiary conjectures related to this one. These conjectures are qualitative. Vojta has made quantitative conjectures by relating the Second Main Theorem of Nevan linna theory to the theory of heights, and he has conjectured bounds on heights stemming from inequalities having to do with diophantine approximations and implying both classical and modern conjectures. Noguchi has looked at the function field case and made substantial progress, after the line started by Grauert and Grauert-Reckziegel and continued by a recent paper of Riebesehl. The book is divided into three main parts: the basic complex analytic theory, differential geometric aspects, and Nevanlinna theory. Several chapters of this book are logically independent of each other.

Developed over more than a century, and still an active area of research today, the classification of algebraic surfaces is an intricate and fascinating branch of mathematics. In this book Professor Beauville gives a lucid and concise account of the subject, following the strategy of F. Enriques, but expressed simply in the language of modern topology and sheaf theory, so as to be accessible to any budding geometer. This volume is self contained and the exercises succeed both in giving the flavour of the extraordinary wealth of examples in the classical subject, and in equipping the reader with most of the techniques needed for research.

This second edition of a successful graduate text provides a careful and detailed algebraic introduction to Grothendieck's local cohomology theory, including in multi-graded situations, and provides many illustrations of the theory in commutative algebra and in the geometry of quasi-affine and quasi-projective varieties. Topics covered include Serre's Affineness Criterion, the Lichtenbaum-Hartshorne Vanishing Theorem, Grothendieck's Finiteness Theorem and Faltings' Annihilator Theorem, local duality and canonical modules, the Fulton-Hansen Connectedness Theorem for projective varieties, and connections between local cohomology and both reductions of ideals and sheaf cohomology. The book is designed for graduate students who have some experience of basic commutative algebra and homological algebra and also experts in commutative algebra and algebraic geometry. Over 300 exercises are interspersed among the text; these range in difficulty from routine to challenging, and hints are provided for some of the more difficult ones.

This is a modern introduction to Kaehlerian geometry and Hodge structure. Coverage begins with variables, complex manifolds, holomorphic vector bundles, sheaves and cohomology theory (with the latter being treated in a more theoretical way than is usual in geometry). The book culminates with the Hodge decomposition theorem. In between, the author proves the Kaehler identities, which leads to the hard Lefschetz theorem and the Hodge index theorem. The second part of the book investigates the meaning of these results in several directions.

This text on complex variables is geared toward graduate students and undergraduates who have taken an introductory course in real analysis. It is a substantially revised and updated edition of the popular text by Robert B. Ash, offering a concise treatment that provides careful and complete explanations as well as numerous problems and solutions. An introduction presents basic

definitions, covering topology of the plane, analytic functions, real-differentiability and the Cauchy-Riemann equations, and exponential and harmonic functions. Succeeding chapters examine the elementary theory and the general Cauchy theorem and its applications, including singularities, residue theory, the open mapping theorem for analytic functions, linear fractional transformations, conformal mapping, and analytic mappings of one disk to another. The Riemann mapping theorem receives a thorough treatment, along with factorization of analytic functions. As an application of many of the ideas and results appearing in earlier chapters, the text ends with a proof of the prime number theorem.
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.

An Algebraic Introduction to Complex Projective GeometryCommutative AlgebraCambridge University Press

This book is based on a first-year graduate course I gave three times at the University of Chicago. As it was addressed to graduate students who intended to specialize in mathematics, I tried to put the classical theory of functions of a complex variable in context, presenting proofs and points of view which relate the subject to other branches of mathematics. Complex analysis in one variable is ideally suited to this attempt. Of course, the branches of mathema tics one chooses, and the connections one makes, must depend on personal taste and knowledge. My own leaning towards several complex variables will be apparent, especially in the notes at the end of the different chapters. The first three chapters deal largely with classical material which is avai lable in the many books on the subject. I have tried to present this material as efficiently as I could, and, even here, to show the relationship with other branches of mathematics. Chapter 4 contains a proof of Picard's theorem; the method of proof I have chosen has far-reaching generalizations in several complex variables and in differential geometry. The next two chapters deal with the Runge approximation theorem and its many applications. The presentation here has been strongly influenced by work on several complex variables.

An introduction to algebraic K-theory with no prerequisite beyond a first semester of algebra.

Easily accessible Includes recent developments Assumes very little knowledge of differentiable manifolds and functional analysis Particular emphasis on topics related to mirror symmetry (SUSY, Kaehler-Einstein metrics, Tian-Todorov lemma)

This development of the theory of complex algebraic curves was one of the peaks of nineteenth century mathematics. They have many fascinating properties and arise in various areas of mathematics, from number theory to theoretical physics, and are the subject of much research. By using only the basic techniques acquired in most undergraduate courses in mathematics, Dr. Kirwan introduces the theory, observes the algebraic and topological properties of complex algebraic curves, and shows how they are related to complex analysis. This text presents an integrated development of the theory of several complex variables and complex algebraic geometry, leading to proofs of Serre's celebrated GAGA theorems relating the two subjects, and including applications to the representation theory of complex semisimple Lie groups. It includes a thorough treatment of the local theory using the tools of commutative algebra, an extensive development of sheaf theory and the theory of coherent analytic and algebraic sheaves, proofs of the main vanishing theorems for these categories of sheaves, and a complete proof of the finite dimensionality of the cohomology of coherent sheaves on compact varieties. The vanishing theorems have a wide variety of applications and these are covered in detail. Of particular interest are the last three chapters, which are devoted to applications of the preceding material to the study of the structure and representations of complex semisimple Lie groups.Included in this text are introductions to harmonic analysis, the Peter-Weyl theorem, Lie theory and the structure of Lie algebras, semisimple Lie algebras and their representations, algebraic groups and the structure of complex semisimple Lie groups. All of this culminates in Milicic's proof of the Borel-Weil-Bott theorem, which makes extensive use of the material developed earlier in the text. There are numerous examples and exercises in each chapter. This modern treatment of a classic point of view would be an excellent text for a graduate course on several complex variables, as well as a useful reference for the expert. Since the 1960s, there has been a flowering in higher-dimensional complex analysis. Both classical and new results in this area have found numerous applications in analysis, differential and algebraic geometry, and, in particular, contemporary mathematical physics. In many areas of modern mathematics, the mastery of the foundations of higher-dimensional complex analysis has become necessary for any specialist. Intended as a first study of higher-dimensional complex analysis, this book covers the theory of holomorphic functions of several complex variables, holomorphic mappings, and submanifolds of complex Euclidean space. Focusing on basics of algebraic theory, this text presents detailed explanations of integral functions, permutations, and groups as well as Lagrange and Galois theory. Many numerical examples with complete solutions. 1930 edition.

In this introduction to commutative algebra, the author choses a route that leads the reader through the essential ideas, without getting embroiled in technicalities. He takes the reader quickly to the fundamentals of complex projective geometry, requiring only a basic knowledge of linear and multilinear algebra and some elementary group theory. The author divides the book into three parts. In the first, he develops the general theory of noetherian rings and modules. He includes a certain amount of homological algebra, and he emphasizes rings and modules of fractions as preparation for working with sheaves. In the second part, he discusses polynomial rings in several variables with coefficients in the field of complex numbers. After Noether's normalization lemma and Hilbert's Nullstellensatz, the author introduces affine complex schemes and their morphisms; he then proves Zariski's main theorem and Chevalley's semi-continuity theorem. Finally, the author's detailed study of Weil and Cartier divisors provides a solid background for modern intersection theory. This is an excellent textbook for those who seek an efficient and rapid introduction to the geometric applications of commutative algebra.

The fundamental theorem of algebra states that any complex polynomial must have a complex root. This book examines three pairs of proofs of the theorem from three different areas of mathematics: abstract algebra, complex analysis and topology. The first proof in each pair is fairly straightforward and depends only on what could be considered elementary mathematics. However, each of these first proofs leads to more general results from which the fundamental theorem can be deduced as a direct consequence. These general results constitute the second proof in each pair. To arrive at each of the proofs, enough of the general theory of each relevant area is developed to understand the proof. In addition to the proofs and techniques themselves, many applications such as the insolvability of the quintic and the transcendence of e and pi are presented. Finally, a series of appendices give six additional proofs including a version of Gauss'original first proof. The book is intended for junior/senior level undergraduate mathematics students or first year graduate students, and would make an ideal "capstone" course in mathematics.

This book differs from a number of recent books on this subject in that it combines analytic and geometric methods at the outset, so that the reader can grasp the basic results of the subject. Although such modern techniques of sheaf theory, cohomology, and commutative algebra are not covered here, the book provides a solid foundation to proceed to more advanced texts in general algebraic geometry, complex manifolds, and Riemann surfaces, as well as algebraic curves. Containing numerous exercises this book would make an excellent introductory text.

Algebraic curves are the graphs of polynomial equations in two vari 3 ables, such as y3 + 5xy2 = x + 2xy. By focusing on curves of degree at most 3-lines, conics, and cubics-this book aims to fill the gap between the familiar subject of analytic geometry and the general study of alge braic curves. This text is designed for a one-semester class that serves both as a a geometry course for mathematics majors in general and as a sequel to college geometry for teachers of secondary school mathe matics. The only prerequisite is first-year calculus. On the one hand, this book can serve as a text for an undergraduate geometry course for all mathematics majors. Algebraic geometry unites algebra, geometry, topology, and analysis, and it is one of the most exciting areas of modem mathematics. Unfortunately, the subject is not easily accessible, and most introductory courses require a prohibitive amount of mathematical machinery. We avoid this problem by focusing on curves of degree at most 3. This keeps the results tangible and the proofs natural. It lets us emphasize the power of two fundamental ideas, homogeneous coordinates and intersection multiplicities.

A lively and vivid look at the material from function theory, including the residue calculus, supported by examples and practice exercises throughout. There is also ample discussion of the historical evolution of the theory, biographical sketches of important contributors, and citations - in the original language with their English translation - from their classical works. Yet the book is far from being a mere history of function theory, and even experts will find a few new or long forgotten gems here. Destined to accompany students making their way into this classical area of mathematics, the book offers quick access to the essential results for exam preparation. Teachers and interested mathematicians in finance, industry and science will profit from reading this again and again, and will refer back to it with pleasure.