From Holomorphic Functions To Complex Manifolds

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Complex

Analysis Springer Science & Business Media With this second volume, we enter the intriguing world of complex analysis. From the first theorems on, the elegance and sweep of the results is evident. The starting point is the simple idea of extending a function initially given for real values of the argument to one that is defined when the argument is complex. From there, one proceeds to the main properties of holomorphic functions, whose proofs are generally short and quite illuminating: the Cauchy theorems, residues, analytic continuation, the argument principle. With this background, the reader is ready to learn a wealth of additional material connecting the subject with other areas of mathematics: the Fourier transform treated by contour integration, the zeta function and the prime number theorem, and an introduction to elliptic functions culminating in their application to combinatorics and number theory. Thoroughly developing a subject with many ramifications, while striking a careful balance between conceptual insights and the technical underpinnings of rigorous

analysis, Complex Analysis will be welcomed by students of mathematics, physics, engineering and other sciences. The Princeton Lectures in Analysis represents a sustained effort to introduce the core areas of mathematical analysis while also illustrating the organic unity between them. Numerous examples and applications throughout its four planned volumes, of which Complex Analysis is the second, highlight the far-reaching consequences of certain ideas in analysis to other fields of mathematics and a variety of sciences. Stein and Shakarchi move from an introduction addressing Fourier series and integrals to in-depth considerations of complex analysis; measure and integration theory, and Hilbert spaces; and, finally, further topics such as functional analysis, distributions and elements of probability theory.

Elementary Real and Complex Analysis

Elsevier

Emphasizing integral formulas, the geometric theory of pseudoconvexity, estimates, partial differential equations, approximation theory, inner functions, invariant metrics, and mapping theory, this title is intended for the student with a background in

real and complex variable theory, harmonic analysis, and differential equations.

Holomorphic Functions of Several Variables

Springer Science & Business Media

Several Complex Variables and the Geometry of Real Hypersurfaces covers a wide range of information from basic facts about holomorphic functions of several complex variables through deep results such as subelliptic estimates for the ?-Neumann problem on pseudoconvex domains with a real analytic boundary. The book focuses on describing the geometry of a real hypersurface in a complex vector space by understanding its relationship with ambient complex analytic varieties. You will learn how to decide whether a real hypersurface contains complex varieties, how closely such varieties can contact the hypersurface, and why it's important. The book concludes with two sets of problems: routine problems and difficult problems (many of which are unsolved). Principal prerequisites for using this book include a thorough understanding of advanced calculus and standard knowledge of complex analysis in one variable. Several Complex

Variables and the Geometry of Real Hypersurfaces will be a useful text for advanced graduate students and professionals working in complex analysis. *Boundary Behavior of Holomorphic Functions of Several Complex Variables. (MN-11)* Cambridge University Press
... Je mehr ich tiber die Principien der Functionentheorie nachdenke - und ich thue dies unablassig -, urn so fester wird meine Uberzeugung, dass diese auf dem Fundamente algebraischer Wahrheiten aufgebaut werden muss (WEIERSTRASS, Glaubensbekenntnis 1875, Math. Werke II, p. 235). 1. Sheaf Theory is a general tool for handling questions which involve local solutions and global patching. "La notion de faisceau s'introduit parce qu'il s'agit de passer de donnees 'locales' a l'etude de proprietes 'globales'" [CAR], p. 622. The methods of sheaf theory are algebraic. The notion of a sheaf was first introduced in 1946 by J. LERAY in a short note Eanneau d'homologie d'une representation, C.R. Acad. Sci. 222, 1366-68. Of course sheaves had occurred implicitly much earlier in mathematics. The "Monogene

analytische Functionen", which K. WEIERSTRASS glued together from "Func tionselemente durch analytische Fortsetzung", are simply the connected components of the sheaf of germs of holomorphic functions on a RIEMANN surface*'; and the "ideaux de domaines indetermines", basic in the work of K. OKA since 1948 (cf. [OKA], p. 84, 107), are just sheaves of ideals of germs of holomorphic functions.

Highly original contributions to mathematics are usually not appreciated at first. Fortunately H. CARTAN immediately realized the great importance of LERAY'S new abstract concept of a sheaf. In the polycopied notes of his Semina ire at the E.N.S

Visual Complex Analysis
Walter de Gruyter

The authors' aim here is to present a precise and concise treatment of those parts of complex analysis that should be familiar to every research mathematicia n. They follow a path in the tradition of Ahlfors and Bers by dedicating the book to a very precise goal: the statement and proof of the Fundamental Theorem for functions of one complex variable. They discuss the many equivalent ways of understanding the concept of analyticity,

and offer a leisure exploration of interesting consequences and applications. Readers should have had undergraduate courses in advanced calculus, linear algebra, and some abstract algebra. No background in complex analysis is required.

From Stein to Weinstein and Back

Princeton University Press

The theory of analytic functions of several complex variables enjoyed a period of remarkable development in the middle part of the twentieth century. After initial successes by Poincaré and others in the late 19th and early 20th centuries, the theory encountered obstacles that prevented it from growing quickly into an analogue of the theory for functions of one complex variable. Beginning in the 1930s, initially through the work of Oka, then H. Cartan, and continuing with the work of Grauert, Remmert, and others, new tools were introduced into the theory of several complex variables that resolved many of the open problems and fundamentally changed the landscape of the subject. These tools included a central role for sheaf theory and increased uses of topology and algebra. The book by Gunning and

Rossi was the first of the modern era of the theory of several complex variables, which is distinguished by the use of these methods. The intention of Gunning and Rossi's book is to provide an extensive introduction to the Oka-Cartan theory and some of its applications, and to the general theory of analytic spaces. Fundamental concepts and techniques are discussed as early as possible. The first chapter covers material suitable for a one-semester graduate course, presenting many of the central problems and techniques, often in special cases. The later chapters give more detailed expositions of sheaf theory for analytic functions and the theory of complex analytic spaces. Since its original publication, this book has become a classic resource for the modern approach to functions of several complex variables and the theory of analytic spaces. Further information about this book, including updates, can be found at the following URL: www.ams.org/publications/authors/books/postpub/chel-368.

Classical Topics in Complex Function Theory

Springer Science & Business Media

This book is devoted to the interplay between complex and symplectic geometry in affine complex manifolds. Affine complex (a.k.a. Stein) manifolds have canonically built into them symplectic geometry which is responsible for many phenomena in complex geometry and analysis. The goal of the book is the exploration of this symplectic geometry (the road from 'Stein to Weinstein') and its applications in the complex geometric world of Stein manifolds (the road 'back').

Analytic Functions of Several Complex Variables

Boom Koninklijke Uitgevers

The book provides an introduction to the theory of functions of several complex variables and their singularities, with special emphasis on topological aspects. The topics include Riemann surfaces, holomorphic functions of several variables, classification and deformation of singularities, fundamentals of differential topology, and the topology of singularities. The aim of the book is to guide the reader from the fundamentals to more advanced topics of recent research. All the necessary prerequisites are specified and carefully explained. The

general theory is illustrated by various examples and applications.

Holomorphic Spaces

Courier Corporation

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)

Function Theory of One Complex Variable

Walter de Gruyter GmbH & Co KG

Complex analysis is one of the most central subjects in mathematics. It is compelling and rich in its own right, but it is also remarkably useful in a wide variety of other mathematical subjects, both pure and applied. This book is different from others in that it treats complex variables as a direct development from multivariable real calculus. As each new idea is introduced, it is related to the corresponding idea from real analysis and calculus. The text is rich with examples andexercises that illustrate this point. The authors have systematically separated the analysis from the topology, as can be seen in their proof of the Cauchy theorem. The book concludes with several

chapters on special topics, including full treatments of special functions, the prime number theorem,and the Bergman kernel. The authors also treat Hp spaces and Painleve's theorem on smoothness to the boundary for conformal maps. This book is a text for a first-year graduate course in complex analysis. It is an engaging and modern introduction to the subject, reflecting the authors' expertise both as mathematicians and as expositors.

Several Complex Variables II
Springer Science & Business Media
The first survey of its kind, written by internationally known, outstanding experts who developed substantial parts of the field. The book contains an introduction written by Remmert, describing the history of the subject, and is very useful to graduate students and researchers in complex analysis, algebraic geometry and differential geometry.

Several Complex Variables
Springer Science & Business Media
This authoritative text presents the classical theory of functions of a single complex variable in complete mathematical and historical detail. Requiring only minimal, undergraduate-level

prerequisites, it covers the fundamental areas of the subject with depth, precision, and rigor. Standard and novel proofs are explored in unusual detail, and exercises – many with helpful hints – provide ample opportunities for practice and a deeper understanding of the material. In addition to the mathematical theory, the author also explores how key ideas in complex analysis have evolved over many centuries, allowing readers to acquire an extensive view of the subject's development. Historical notes are incorporated throughout, and a bibliography containing more than 2,000 entries provides an exhaustive list of both important and overlooked works. Classical Analysis in the Complex Plane will be a definitive reference for both graduate students and experienced mathematicians alike, as well as an exemplary resource for anyone doing scholarly work in complex analysis. The author's expansive knowledge of and passion for the material is evident on every page, as is his desire to impart a lasting appreciation for the subject. "I can honestly say that Robert Burckel's book has profoundly influenced my view of the subject of

complex analysis. It has given me a sense of the historical flow of ideas, and has acquainted me with byways and ancillary results that I never would have encountered in the ordinary course of my work. The care exercised in each of his proofs is a model of clarity in mathematical writing...Anyone in the field should have this book on [their bookshelves] as a resource and an inspiration."- From the Foreword by Steven G. Krantz *Complex Made Simple* Walter de Gruyter GmbH & Co KG Complex Function Theory is a concise and rigorous introduction to the theory of functions of a complex variable. Written in a classical style, it is in the spirit of the books by Ahlfors and by Saks and Zygmund. Being designed for a one-semester course, it is much shorter than many of the standard texts. Sarason covers the basic material through Cauchy's theorem and applications, plus the Riemann mapping theorem. It is suitable for either an introductory graduate course or an undergraduate course for students with adequate preparation. The first edition was published with the title Notes on Complex Function Theory. *Classical*

Analysis in the Complex Plane Springer Science & Business Media

The theory of complex analytic sets is part of the modern geometrical theory of functions of several complex variables. A wide circle of problems in multidimensional complex analysis, related to holomorphic functions and maps, can be reformulated in terms of analytic sets. In these reformulations additional phenomena may emerge, while for the proofs new methods are necessary. (As an example we can mention the boundary properties of conformal maps of domains in the plane, which may be studied by means of the boundary properties of the graphs of such maps.) The theory of complex analytic sets is a relatively young branch of complex analysis. Basically, it was developed to fulfill the need of the theory of functions of several complex variables, but for a long time its development was, so to speak, within the framework of algebraic geometry - by analogy with algebraic sets. And although at present the basic methods of the theory of analytic sets are related with analysis and geometry, the foundations of the theory are expounded in the purely algebraic language of ideals in

commutative algebras. In the present book I have tried to eliminate this noncorrespondence and to give a geometric exposition of the foundations of the theory of complex analytic sets, using only classical complex analysis and a minimum of algebra (well-known properties of polynomials of one variable). Moreover, it must of course be taken into consideration that algebraic geometry is one of the most important domains of application of the theory of analytic sets, and hence a lot of attention is given in the present book to algebraic sets.

An Introduction to Complex Analysis in Several Variables

Springer Science & Business Media

This radical first course on complex analysis brings a beautiful and powerful subject to life by consistently using geometry (not calculation) as the means of explanation. Aimed at undergraduate students in mathematics, physics, and engineering, the book's intuitive explanations, lack of advanced prerequisites, and consciously user-friendly prose style will help students to master the subject more readily than was previously possible. The key to this is the book's use

of new geometric arguments in place of the standard calculational ones. These geometric arguments are communicate d with the aid of hundreds of diagrams of a standard seldom encountered in mathematical works. A new approach to a classical topic, this work will be of interest to students in mathematics, physics, and engineering, as well as to professionals in these fields.

From Holomorphic Functions to Complex Manifolds

American Mathematical Soc.

This volume presents the proceedings of the Seventh International Colloquium on Finite or Infinite Dimensional Complex Analysis held in Fukuoka, Japan. The contributions offer multiple perspectives and numerous research examples on complex variables, Clifford algebra variables, hyperfunction s and numerical analysis.

Complex Analysis in one Variable

Oxford University Press

The purpose of this book is to develop the foundations of the theory of holomorphicit y on the ring of bicomplex numbers. Accordingly, the main focus is on expressing the similarities with, and differences from, the classical theory of one complex variable. The result is an elementary yet

comprehensive introduction to the algebra, geometry and analysis of bicomplex numbers. Around the middle of the nineteenth century, several mathematicians (the best known being Sir William Hamilton and Arthur Cayley) became interested in studying number systems that extended the field of complex numbers. Hamilton famously introduced the quaternions, a skew field in real-dimension four, while almost simultaneously James Cockle introduced a commutative four-dimensional real algebra, which was rediscovered in 1892 by Corrado Segre, who referred to his elements as bicomplex numbers. The advantages of commutativity were accompanied by the introduction of zero divisors, something that for a while dampened interest in this subject. In recent years, due largely to the work of G.B. Price, there has been a resurgence of interest in the study of these numbers and, more importantly, in the study of functions defined on the ring of bicomplex numbers, which mimic the behavior of holomorphic functions of a complex variable. While the algebra of bicomplex numbers is a four-

dimensional real algebra, it is useful to think of it as a “complexification” of the field of complex numbers; from this perspective, the bicomplex algebra possesses the properties of a one-dimensional theory inside four real dimensions. Its rich analysis and innovative geometry provide new ideas and potential applications in relativity and quantum mechanics alike. The book will appeal to researchers in the fields of complex, hypercomplex and functional analysis, as well as undergraduate and graduate students with an interest in one- or multidimensional complex analysis.

Function Theory of Several Complex Variables

Cambridge University Press

This introduction to the theory of complex manifolds covers the most important branches and methods in complex analysis of several variables while completely avoiding abstract concepts involving sheaves, coherence, and higher-dimensional cohomology. Only elementary methods such as power series, holomorphic vector bundles, and one-dimensional cocycles are used. Each chapter

contains a variety of examples and exercises.

Complex Analysis

American Mathematical Society

I - Entire functions of several complex variables constitute an important and original chapter in complex analysis. The study is often motivated by certain applications to specific problems in other areas of mathematics: partial differential equations via the Fourier-Laplace transformation and convolution operators, analytic number theory and problems of transcen dence, or approximation theory, just to name a few. What is important for these applications is to find solutions which satisfy certain growth conditions. The specific problem defines inherently a growth scale, and one seeks a solution of the problem which satisfies certain growth conditions on this scale, and sometimes solutions of minimal asymp totic growth or optimal solutions in some sense. For one complex variable the study of solutions with growth conditions forms the core of the classical theory of entire functions and, historically, the relationship between the number of zeros of an entire function f(z) of one complex

variable and the growth of If I (or equivalently log If I) was the first example of a systematic study of growth conditions in a general setting. Problems with growth conditions on the solutions demand much more precise information than existence theorems. The correspondenc e between two scales of growth can be interpreted often as a correspondenc e between families of bounded sets in certain Frechet spaces. However, for applications it is of utmost importance to develop precise and explicit representation s of the solutions. Extension of Holomorphic Functions CRC 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 generalization s 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.