Function Theory Of One Complex Variable Solutions

Presented from the point of view of modern work in the field, this book addresses advanced topics in complex analysis that verge on current areas of research. It adroitly weaves through a variety of topics to reveal a number of delightful interactions and is methodically designed with individual chapters containing a rich collection of exercises, examples, and illustrations.
An ideal text for an advanced course in the theory of complex functions, this book leads readers to experience function theory personally and to participate in the work of the creative mathematician. The author includes numerous glimpses of the function theory of several complex variables, which illustrate how autonomous this discipline has become. In addition to standard topics, readers will find Eisenstein's proof of Euler's product formula for the sine function; Wielandts uniqueness theorem for the gamma function; Stirlings formula; Isssas theorem; Besses proof that all domains in C are domains of holomorphy; Wedderburns lemma and the ideal theory of rings of holomorphic functions; Estermanns proofs of the overconvergence theorem and Blochs theorem; a holomorphic imbedding of the unit disc in C3; and Gausss expert opinion on Riemanns dissertation. Remmert elegantly presents the material in short clear sections, with compact proofs and historical comments interwoven throughout the text. The abundance of examples, exercises, and historical remarks, as well as the extensive bibliography, combine to make an invaluable source for students and teachers alike
This book discusses a variety of problems which are usually treated in a second course on the theory of functions of one complex variable, the level being gauged for graduate students. It treats several topics in geometric function theory as well as potential theory in the plane, covering in particular: conformal equivalence for simply connected regions, conformal equivalence for finitely connected regions, analytic covering maps, de Branges' proof of the Bieberbach conjecture, harmonic functions, Hardy spaces on the disk, potential theory in the plane. A knowledge of integration theory and functional analysis is assumed.
This book provides a rigorous yet elementary introduction to the theory of analytic functions of a single complex variable. While presupposing in its readership a degree of mathematical maturity, it insists on no formal prerequisites beyond a sound knowledge of calculus. Starting from basic definitions, the text slowly and carefully develops the ideas of complex analysis to the point where such landmarks of the subject as Cauchy's theorem, the Riemann mapping theorem, and the theorem of Mittag-Leffler can be treated without sidestepping any issues of rigor. The emphasis throughout is a geometric one, most pronounced in the extensive chapter dealing with conformal mapping, which amounts essentially to a "short course" in that important area of complex function theory. Each chapter concludes with a wide selection of exercises, ranging from straightforward computations to problems of a more conceptual and thought-provoking nature.
Function Theory of One Complex VariableAmerican Mathematical Soc.
The purpose of this book is to present the classical analytic function theory of several variables as a standard subject in a course of mathematics after learning the elementary materials (sets, general topology, algebra, one complex variable). This includes the essential parts of Grauert–Remmert's two volumes, GL227(236) (Theory of Stein spaces) and GL265 (Coherent analytic sheaves) with a lowering of the level for novice graduate students (here, Grauert's direct image theorem is limited to the case of finite maps).The core of the theory is "Oka's Coherence", found and proved by Kiyoshi Oka. It is indispensable, not only in the study of complex analysis and complex geometry, but also in a large area of modern mathematics. In this book, just after an introductory chapter on holomorphic functions (Chap. 1), we prove Oka's First Coherence Theorem for holomorphic functions in Chap. 2. This defines a unique character of the book compared with other books on this subject, in which the notion of coherence appears much later.The present book, consisting of nine chapters, gives complete treatments of the following items: Coherence of sheaves of holomorphic functions (Chap. 2); Oka–Cartan's Fundamental Theorem (Chap. 4); Coherence of ideal sheaves of complex analytic subsets (Chap. 6); Coherence of the normalization sheaves of complex spaces (Chap. 6); Grauert's Finiteness Theorem (Chaps. 7, 8); Oka's Theorem for Riemann domains (Chap. 8). The theories of sheaf cohomology and domains of holomorphy are also presented (Chaps. 3, 5). Chapter 6 deals with the theory of complex analytic subsets. Chapter 8 is devoted to the applications of formerly obtained results, proving Cartan–Serre's Theorem and Kodaira's Embedding Theorem. In Chap. 9, we discuss the historical development of "Coherence".It is difficult to find a book at this level that treats all of the above subjects in a completely self-contained manner. In the present volume, a number of classical proofs are improved and simplified, so that the contents are easily accessible for beginning graduate students.
This book is dedicated to Victor Emmanuilovich Katsnelson on the occasion of his 75th birthday and celebrates his broad mathematical interests and contributions.Victor Emmanuilovich’s mathematical career has been based mainly at the Kharkov University and the Weizmann Institute. However, it also included a one-year guest professorship at Leipzig University in 1991, which led to him establishing close research contacts with the Schur analysis group in Leipzig, a collaboration that still continues today. Reflecting these three periods in Victor Emmanuilovich's career, present and former colleagues have contributed to this book with research inspired by him and presentations on their joint work. Contributions include papers in function theory (Favorov-Golinskii, Friedland-Goldman-Yomdin, Kheifets-Yuditskii) , Schur analysis, moment problems and related topics (Boiko-Dubovoy, Dyukarev, Fritzsche-Kirstein-Mädler), extension of linear operators and linear relations (Dijksma-Langer, Hassi-de Snoo, Hassi -Wietsma) and non-commutative analysis (Ball-Bolotnikov, Cho-Jorgensen).
Over 1500 problems on theory of functions of the complex variable; coverage of nearly every branch of classical function theory. Topics include conformal mappings, integrals and power series, Laurent series, parametric integrals, integrals of the Cauchy type, analytic continuation, Riemann surfaces, much more. Answers and solutions at end of text. Bibliographical references. 1965 edition.
Fundamentals of analytic function theory — plus lucid exposition of 5 important applications: potential theory, ordinary differential equations, Fourier transforms, Laplace transforms, and asymptotic expansions. Includes 66 figures.
This book is a translation by F. Steinhardt of the last of Carathéodory's celebrated text books, Funktiontheorie, Volume 1. Reviews & Endorsements A book by a master …

Carathéodory himself regarded [it] as his finest achievement … written from a catholic point of view. -- Bulletin of the AMS

This reference details valuable results that lead to improvements in existence theorems for the Loewner differential equation in higher dimensions, discusses the compactness of the analog of the Caratheodory class in several variables, and studies various classes of univalent mappings according to their geometrical definitions. It introduces the in

Basic treatment includes existence theorem for solutions of differential systems where data is analytic, holomorphic functions, Cauchy's integral, Taylor and Laurent expansions, more. Exercises. 1973 edition.

Geometric Function Theory is that part of Complex Analysis which covers the theory of conformal and quasiconformal mappings. Beginning with the classical Riemann mapping theorem, there is a lot of existence theorems for canonical conformal mappings. On the other side there is an extensive theory of qualitative properties of conformal and quasiconformal mappings, concerning mainly a prior estimates, so called distortion theorems (including the Bieberbach conjecture with the proof of the Branges). Here a starting point was the classical Scharz lemma, and then Koebe's distortion theorem. There are several connections to mathematical physics, because of the relations to potential theory (in the plane). The Handbook of Geometric Function Theory contains also an article about constructive methods and further a Bibliography including applications eg: to electroxtatic problems, heat conduction, potential flows (in the plane). · A collection of independent survey articles in the field of GeometricFunction Theory · Existence theorems and qualitative properties of conformal and quasiconformal mappings · A bibliography, including many hints to applications in electrostatics, heat conduction, potential flows (in the plane).

Dr Smithies' analysis of the process whereby Cauchy created the basic structure of complex analysis, begins by describing the 18th century background. He then proceeds to examine the stages of Cauchy's own work, culminating in the proof of the residue theorem. Controversies associated with the the birth of the subject are also considered in detail. Throughout, new light is thrown on Cauchy's thinking during this watershed period. This authoritative book is the first to make use of the whole spectrum of available original sources.

The theory of several complex variables can be studied from several different perspectives. In this book, Steven Krantz approaches the subject from the point of view of a classical analyst, emphasizing its function-theoretic aspects. He has taken particular care to write the book with the student in mind, with uniformly extensive and helpful explanations, numerous examples, and plentiful exercises of varying difficulty. In the spirit of a student-oriented text, Krantz begins with an introduction to the subject, including an insightful comparison of analysis of several complex variables with the more familiar theory of one complex variable. The main topics in the book include integral formulas, convexity and pseudoconvexity, methods from harmonic analysis, and several aspects of the $\overline{\partial}$ problem. Some further topics are zero sets of holomorphic functions, estimates, partial differential equations, approximation theory, the boundary behavior of holomorphic functions, inner functions, invariant metrics, and holomorphic mappings. While due attention is paid to algebraic aspects of several complex variables (sheaves, Cousin problems, etc.), the student with a background in real and complex variable theory, harmonic analysis, and differential equations will be most comfortable with this treatment. This book is suitable for a first graduate course in several complex variables.

Plurisubharmonic functions playa major role in the theory of functions of several complex variables. The extensiveness of plurisubharmonic functions, the simplicity of their definition together with the richness of their properties and. most importantly, their close connection with holomorphic functions have assured plurisubharmonic functions a lasting place in multidimensional complex analysis. (Pluri)subharmonic functions first made their appearance in the works of Hartogs at the beginning of the century. They figure in an essential way, for example, in the proof of the famous theorem of Hartogs (1906) on joint holomorphicity. Defined at first on the complex plane IC, the class of subharmonic functions became thereafter one of the most fundamental tools in the investigation of analytic functions of one or several variables. The theory of subharmonic functions was developed and generalized in various directions: subharmonic functions in Euclidean space IRn, plurisubharmonic functions in complex space en and others. Subharmonic functions and the foundations ofthe associated classical poten tial theory are sufficiently well exposed in the literature, and so we introduce here only a few fundamental results which we require. More detailed expositions can be found in the monographs of Privalov (1937), Brelot (1961), and Landkof (1966). See also Brelot (1972), where a history of the development of the theory of subharmonic functions is given.

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.

Geared toward upper-level undergraduates and graduate students, this clear, self-contained treatment of important areas in complex analysis is chiefly classical in content and emphasizes geometry of complex mappings. 1967 edition.

Develops the higher parts of function theory in a unified presentation. Starts with elliptic integrals and functions and uniformization theory, continues with automorphic functions and the theory of abelian integrals and ends with the theory of abelian functions and modular functions in several variables. The last topic originates with the author and appears here for the first time in book form.

This treatment of complex analysis focuses on function theory on a finitely connected planar domain. It emphasizes domains bounded by a finite number of disjoint analytic simple closed curves. 1983 edition.

This book is intended as a textbook for a first course in the theory of functions of one complex variable for students who are mathematically mature enough to understand and execute E - I) arguments. The actual pre requisites for reading this book are quite minimal; not much more than a stiff course in basic calculus and a few facts about partial derivatives. The topics from advanced calculus that are used (e.g., Leibniz's rule for differ entiating under the integral sign) are proved in detail. Complex Variables is a subject which has something for all mathematicians. In addition to having applications to other parts of analysis, it can rightly claim to be an ancestor of many areas of mathematics (e.g., homotopy theory, manifolds). This view of Complex Analysis as "An Introduction to Mathe matics" has influenced the writing and selection of subject matter for this book. The other guiding principle followed is that all definitions, theorems, etc.

Functions of a Complex Variable and Some of Their Applications, Volume 1, discusses the fundamental ideas of the theory of functions of a complex variable. The book is the result of a complete rewriting and revision of a translation of the second (1957) Russian edition. Numerous changes and additions have been made, both in the text and in the solutions of the Exercises. The book begins with a review of arithmetical operations with complex numbers. Separate chapters discuss the fundamentals of complex analysis; the concept of conformal transformations; the most important of the elementary functions; and the complex potential for a plane vector field and the application of the simplest methods of function theory to the analysis of such a field. Subsequent chapters cover the fundamental apparatus of the theory of regular functions, i.e. basic integral theorems and expansions in series; the general concept of an analytic function; applications of the theory of residues; and polygonal domain mapping. This book is intended for undergraduate and postgraduate students of higher technical institutes and for engineers wishing to increase their knowledge of theory.

Geometric Function Theory is a central part of Complex Analysis (one complex variable). The Handbook of Complex Analysis - Geometric Function Theory deals with this field and its many ramifications and relations to other areas of mathematics and physics. The theory of conformal and quasiconformal mappings plays a central role in this Handbook, for example a priori-estimates for these mappings which arise from solving extremal problems, and constructive methods are considered. As a new field the theory of circle packings which goes back to P. Koebe is included. The Handbook should be useful for experts as well as for mathematicians working in other areas, as well as for physicists and engineers. · A collection of independent survey articles in the field of GeometricFunction Theory · Existence theorems and qualitative properties of conformal and quasiconformal mappings · A bibliography, including many hints to applications in electrostatics, heat conduction, potential flows (in the plane)

The classical ?p sequence spaces have been a mainstay in Banach spaces. This book reviews some of the foundational results in this area (the basic inequalities, duality, convexity, geometry) as well as connects them to the function theory (boundary growth conditions, zero sets, extremal functions, multipliers, operator theory) of the associated spaces ?pA of analytic functions whose Taylor coefficients belong to ?p. Relations between the Banach space ?p and its associated function space are uncovered using tools from Banach space geometry, including Birkhoff-James orthogonality and the resulting Pythagorean inequalities. The authors survey the literature on all of this material, including a discussion of the multipliers of ?pA and a discussion of the Wiener algebra ?1A. Except for some basic measure theory, functional analysis, and complex analysis, which the reader is expected to know, the material in this book is self-contained and detailed proofs of nearly all the results are given. Each chapter concludes with some end notes that give proper references, historical background, and avenues for further exploration.

This is a rigorous introduction to the theory of complex functions of one complex variable. The authors have made an effort to present some of the deeper and more interesting results, for example, Picard's theorems, Riemann mapping theorem, Runge's theorem in the first few chapters. However, the very basic theory is nevertheless given a thorough treatment so that readers should never feel lost. After the first five chapters, the order may be adapted to suit the course. Each chapter finishes with exercises.

Complex analysis is one of the most beautiful subjects that we learn as graduate students. Part of the joy comes from being able to arrive quickly at some real theorems. The fundamental techniques of complex variables are also used to solve real problems in neighbouring subjects, such as number theory or PDEs.

A thorough introduction to the theory of complex functions emphasizing the beauty, power, and counterintuitive nature of the subject Written with a reader-friendly approach, Complex Analysis: A Modern First Course in Function Theory features a self-contained, concise development of the fundamental principles of complex analysis. After laying groundwork on complex numbers and the calculus and geometric mapping properties of functions of a complex variable, the author uses power series as a unifying theme to define and study the many rich and occasionally surprising properties of analytic functions, including the Cauchy theory and residue theorem. The book concludes with a treatment of harmonic functions and an epilogue on the Riemann mapping theorem. Thoroughly classroom tested at multiple universities, Complex Analysis: A Modern First Course in Function Theory features: Plentiful exercises, both computational and theoretical, of varying levels of difficulty, including several that could be used for student projects Numerous figures to illustrate geometric concepts and constructions used in proofs Remarks at the conclusion of each section that place the main concepts in context, compare and contrast results with the calculus of real functions, and provide historical notes Appendices on the basics of sets and functions and a handful of useful results from advanced calculus Appropriate for students majoring in pure or applied mathematics as well as physics or engineering, Complex Analysis: A Modern First Course in Function Theory is an ideal textbook for a one-semester course in complex analysis for those with a strong foundation in multivariable calculus. The logically complete book also serves as a key reference for mathematicians, physicists, and engineers and is an excellent source for anyone interested in independently learning or reviewing the beautiful subject of complex analysis.

This volume connects complex analysis with calculus, algebra, geometry, topology and analysis. Exercises and illustrations are provided throughout the text. Also included is information on Bergman Kernal and two boundary behaviour of conformal mappings.

Functions of a Complex Variable provides all the material for a course on the theory of functions of a complex variable at the senior undergraduate and beginning graduate level. Also suitable for self-study, the book covers every topic essential to training students in complex analysis. It also incorporates special topics to enhance students' understanding of the subject, laying the foundation for future studies in analysis, linear algebra, numerical analysis, geometry, number theory, physics, thermodynamics, or electrical engineering. After introducing the basic concepts of complex numbers and their geometrical representation, the text describes analytic functions, power series and elementary functions, the conformal representation of an analytic function, special transformations, and complex integration. It next discusses zeros of an analytic function, classification of singularities, and singularity at the point of infinity; residue theory, principle of argument, Rouché's theorem, and the location of zeros of complex polynomial equations; and calculus of residues, emphasizing the techniques of definite integrals by contour integration. The authors then explain uniform convergence of sequences and series involving Parseval, Schwarz, and Poisson formulas. They also present harmonic functions and mappings, inverse mappings, and univalent functions as well as analytic continuation.

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.

In this textbook, a concise approach to complex analysis of one and several variables is presented. After an introduction of Cauchy's integral theorem general versions of Runge's approximation theorem and Mittag-Leffler's theorem are discussed. The fi rst part ends with an analytic characterization of simply connected domains. The second part is concerned with functional analytic methods: Fréchet and Hilbert spaces of holomorphic functions, the Bergman kernel, and unbounded operators on Hilbert spaces to tackle the theory of several variables, in particular the inhomogeneous Cauchy-Riemann equations and the d-bar Neumann operator. Contents Complex numbers and functions Cauchy's Theorem and Cauchy's formula Analytic continuation Construction and approximation of holomorphic functions Harmonic functions Several complex variables Bergman spaces The canonical solution operator to Nuclear Fréchet spaces of holomorphic functions The -complex The twisted -complex and Schrödinger operators

Functions of a complex variable are used to solve applications in various branches of mathematics, science, and engineering. Functions of a Complex Variable: Theory and Technique is a book in a special category of influential classics because it is based on the authors' extensive experience in modeling complicated situations and providing analytic solutions. The book makes available to readers a comprehensive range of these analytical techniques based upon complex variable theory. Advanced topics covered include asymptotics, transforms, the Wiener-Hopf method, and dual and singular integral equations. The authors provide many exercises, incorporating them into the body of the text. Audience: intended for applied mathematicians, scientists, engineers, and senior or graduate-level students who have advanced knowledge in calculus and are interested in such subjects as complex variable theory, function theory, mathematical methods, advanced engineering mathematics, and mathematical physics.

"This book presents a basic introduction to complex analysis in both an interesting and a rigorous manner. It contains enough material for a full year's course, and the choice of material treated is reasonably standard and should be satisfactory for most first courses in complex analysis. The approach to each topic appears to be carefully thought out both as to mathematical treatment and pedagogical presentation, and the end result is a very satisfactory book." --MATHSCINET

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.

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 and exercises 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 H^p 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.

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