Complex Analysis For Mathematics And Engineering

Excellent undergraduate-level text offers coverage of real numbers, sets, metric spaces, limits, continuous functions, much more. Each chapter contains a problem set with hints and answers. 1973 edition.

This second edition presents a collection of exercises on the theory of analytic functions, including completed and detailed solutions. It introduces students to various applications and aspects of the theory of analytic functions not always touched on in a first course, while also addressing topics of interest to electrical engineering students (e.g., the realization of rational functions and its connections to the theory of linear systems and state space representations of such systems). It provides examples of important Hilbert spaces of analytic functions (in particular the Hardy space and the Fock space), and also includes a section reviewing essential aspects of topology, functional analysis and Lebesgue integration. Benefits of the 2nd edition Rational functions are now covered in a separate chapter. Further, the section on conformal mappings has been expanded.

Intended for the undergraduate student majoring in mathematics, physics or engineering, the Sixth Edition of Complex Analysis for Mathematics and Engineering continues to provide a comprehensive, student-friendly presentation of this interesting area of mathematics. The authors strike a balance between the pure and applied aspects of the subject, and present concepts in a clear writing style that is appropriate for students at the junior/senior level. Through its thorough, accessible presentation and numerous applications, the sixth edition of this classic text allows students to work through even the most difficult proofs with ease. New exercise sets help students test their understanding of the material at hand and assess their progress through the course. Additional Mathematica and Maple exercises, as well as a student study guide are also available online.

This user-friendly textbook follows Weierstrass' approach to offer a self-contained introduction to complex analysis.

A new edition of a classic textbook on complex analysis with an emphasis on translating visual intuition to rigorous proof.

This text provides a balance between pure (theoretical) and applied aspects of complex analysis. The many applications of complex analysis to science and engineering are described, and this third edition contains a historical introduction depicting the origins of complex numbers.

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

Modern Real and Complex Analysis Thorough, well-written, and encyclopedic in its coverage, this textoffers a lucid presentation of all the topics essential to graduatestudy in analysis. While maintaining the strictest standards ofrigor, Professor Gelbaum's approach is designed to appeal tointuition whenever possible. Modern Real and Complex Analysisprovides up-to-date treatment of such subjects as the Daniellintegration, differentiation, functional analysis and Banachalgebras, conformal mapping and Bergman's kernels, defectivefunctions, Riemann surfaces and uniformization, and the role ofconvexity in analysis. The text supplies an abundance of exercisesand illustrative examples to reinforce learning, and extensivenotes and remarks to help clarify important points.

Shorter version of Markushevich's Theory of Functions of a Complex Variable, appropriate for advanced undergraduate and graduate courses in complex analysis. More than 300 problems, some with hints and answers. 1967 edition.

Introduction to Complex AnalysisBy Michael Taylor

This radical approach to complex analysis replaces the standard calculational arguments with new geometric ones. Using several hundred diagrams this is a new visual approach to the topic.

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 mathematician. 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.

Complex analysis can be a difficult subject and many introductory texts are just too ambitious for today’s students. This book takes a lower starting point than is traditional and concentrates on explaining the key ideas through worked examples and informal explanations, rather than through "dry" theory.

An introduction to complex analysis for students with some knowledge of complex numbers from high school. It contains sixteen chapters, the first eleven of which are aimed at an upper division undergraduate audience. The remaining five chapters are designed to complete the coverage of all background necessary for passing PhD qualifying exams in complex analysis. Topics studied include Julia sets and the Mandelbrot set, Dirichlet series and the prime number theorem, and the uniformization theorem for Riemann surfaces, with emphasis placed on the three geometries: spherical, euclidean, and hyperbolic. Throughout, exercises range from the very simple to the challenging. The book is based on lectures given by the author at several universities, including UCLA, Brown University, La Plata, Buenos Aires, and the Universidad Autonomo de Valencia, Spain.

Complex Analysis and Applications, Second Edition explains complex analysis for students of applied mathematics and engineering. Restructured and completely revised, this textbook first develops the theory of complex analysis, and then examines its geometrical interpretation and application to Dirichlet and Neumann boundary value problems. A discussion of complex analysis now forms the first three chapters of the book, with a description of conformal mapping and its application to boundary value problems for the two-dimensional Laplace equation forming the final two chapters. This new structure enables students to study theory and applications separately, as needed. In order to maintain brevity and clarity, the text limits the application of complex analysis to two-dimensional boundary value problems related to temperature distribution, fluid flow, and electrostatics. In each case, in order to show the relevance of complex analysis, each application is preceded by mathematical background that demonstrates how a real valued potential function and its related complex potential can be derived from the mathematics that describes the physical situation.

At its core, this concise textbook presents standard material for a first course in complex analysis at the advanced undergraduate level. This distinctive text will prove most rewarding for students who have a genuine passion for mathematics as well as certain mathematical maturity. Primarily aimed at undergraduates with working knowledge of real analysis and metric spaces, this book can also be used to instruct a graduate course. The text uses a conversational style with topics purposefully apportioned into 21 lectures, providing a suitable format for either independent study or lecture-based teaching. Instructors are invited to rearrange the order of topics according to their own vision. A clear and rigorous exposition is supported by engaging examples and exercises unique to each lecture; a large number of exercises contain useful calculation problems. Hints are given for a selection of the more difficult exercises. This text furnishes the reader with a means of learning complex analysis as well as a subtle introduction to careful mathematical reasoning. To guarantee a student's progression, more advanced topics are spread out over several lectures. This text is based on a one-semester (12 week) undergraduate course in complex analysis that the author has taught at the Australian National University for over twenty years. Most of the principal facts are deduced from Cauchy's Independence of Homotopy Theorem allowing us to obtain a clean derivation of Cauchy's Integral Theorem and Cauchy's Integral Formula. Setting the tone for the entire book, the material begins with a proof of the Fundamental Theorem of Algebra to demonstrate the power of complex numbers and concludes with a proof of another major milestone, the Riemann Mapping Theorem, which is rarely part of a one-semester undergraduate course.

Now in its fourth edition, the first part of this book is devoted to the basic material of complex analysis, while the second covers many special topics, such as the Riemann Mapping Theorem, the gamma function, and analytic continuation. Power series methods are used more systematically than is found in other texts, and the resulting proofs often shed more light on the results than the standard proofs. While the first part is suitable for an introductory course at undergraduate level, the additional topics covered in the second part give the instructor of a gradute course a great deal of flexibility in structuring a more advanced course.

Originally published in 2003, reissued as part of Pearson's modern classic series.

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.

Linear and Complex Analysis for Applications aims to unify various parts of mathematical analysis in an engaging manner and to provide a diverse and unusual collection of applications, both to other fields of mathematics and to physics and engineering. The book evolved from several of the author's teaching experiences, his research in complex analysis in several variables, and many conversations with friends and colleagues. It has three primary goals: to develop enough linear analysis and complex variable theory to prepare students in engineering or applied mathematics for advanced work, to unify many distinct and seemingly isolated topics, to show mathematics as both interesting and useful, especially via the juxtaposition of examples and theorems. The book realizes these goals by beginning with reviews of Linear Algebra, Complex Numbers, and topics from Calculus III. As the topics are being reviewed, new material is inserted to help the student develop skill in both computation and theory. The material on linear algebra includes infinite-dimensional examples arising from elementary calculus and differential equations. Line and surface integrals are computed both in the language of classical vector analysis and by using differential forms. Connections among the topics and applications appear throughout the book. The text weaves abstract mathematics, routine computational problems, and applications into a coherent whole, whose unifying theme is linear systems. It includes many unusual examples and contains more than 450 exercises.

This text covers many principal topics in the theory of functions of a complex variable. These include, in real analysis, set algebra, measure and topology, real- and complex-valued functions, and topological vector spaces. In complex analysis, they include polynomials and power series, functions holomorphic in a region, entire functions, analytic continuation, singularities, harmonic functions, families of functions, and convexity theorems.

This is the second volume of the two-volume book on real and complex analysis. This volume is an introduction to the theory of holomorphic functions. Multivalued functions and branches have been dealt carefully with the application of the machinery of complex measures and power series. Intended for undergraduate students of mathematics and engineering, it covers the essential analysis that is needed for the study of functional analysis, developing the concepts rigorously with sufficient detail and with minimum prior knowledge of the fundamentals of advanced calculus required. Divided into four chapters, it discusses holomorphic functions and harmonic functions, Schwarz reflection principle, infinite product and the Riemann mapping theorem, analytic continuation, monodromy theorem, prime number theorem, and Picard's little theorem. Further, it includes extensive exercises and their solutions with each concept. The book examines several useful theorems in the realm of real and complex analysis, most of which are the work of great mathematicians of the 19th and 20th centuries.

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.

Designed for the undergraduate student with a calculus background but no prior experience with complex analysis, this text discusses the theory of the most relevant mathematical topics in a student-friendly manner. With a clear and straightforward writing style, concepts are introduced through numerous examples, illustrations, and applications. Each section of the text contains an extensive exercise set containing a range of computational, conceptual, and geometric problems. In the text and exercises, students are guided and supported through numerous proofs providing them with a higher level of mathematical insight and maturity. Each chapter contains a separate section devoted exclusively to the applications of complex analysis to science and engineering, providing students with the opportunity to develop a practical and clear understanding of complex analysis. The Mathematica syntax from the second edition has been updated to coincide with version 8 of the software. --

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.

Classic Complex Analysis is a text that has been developed over decades of teaching with an enthusiastic student reception. The first half of the book focuses on the core material. An early chapter on power series gives the reader concrete examples of analytic functions and a review of calculus. Mobius transformations are presented with emphasis on the geometric aspect, and the Cauchy theorem is covered in the classical manner. The remaining chapters provide an elegant and solid overview of special topics such as Entire and Meromorphic Functions, Analytic Continuation, Normal Families, Conformal Mapping, and Harmonic Functions.

Research topics in the book include complex dynamics, minimal surfaces, fluid flows, harmonic, conformal, and polygonal mappings, and discrete complex analysis via circle packing. The nature of this book is different from many mathematics texts: the focus is on student-driven and technology-enhanced investigation. Interlaced in the reading for each chapter are examples, exercises, explorations, and projects, nearly all linked explicitly with computer applets for visualization and hands-on manipulation.

This book offers an essential textbook on complex analysis. After introducing the theory of complex analysis, it places special emphasis on the importance of Poincare theorem and Hartog's theorem in the function theory of several complex variables. Further, it lays the groundwork for future study in analysis, linear algebra, numerical analysis, geometry, number theory, physics (including hydrodynamics and thermodynamics), and electrical engineering. To benefit most from the book, students should have some prior knowledge of complex numbers. However, the essential prerequisites are quite minimal, and include basic calculus with some knowledge of partial derivatives, definite integrals, and topics in advanced calculus such as Leibniz's rule for differentiating under the integral sign and to some extent analysis of infinite series. The book offers a valuable asset for undergraduate and graduate students of mathematics and engineering, as well as students with no background in topological properties.

Complex Analysis for Mathematics and Engineering, Fifth Edition is intended for undergraduate students majoring in mathematics, physics, or engineering. The authors strike a balance between the pure and applied aspects of complex analysis, and present concepts in a clear writing style that is appropriate for students at the junior/senior undergraduate level. Through its comprehensive, student-friendly presentation and numerous applications, the Fifth Edition of this classic text allows students to work through even the most difficult proofs with ease. Believing that mathematicians, engineers, and scientists should be exposed to a careful presentation of mathematics, the authors devote attention to important topics such as ensuring that required assumptions are met before using a theorem, confirming that algebraic operations are valid, and checking that formulas are not blindly applied. A new chapter on z-transforms and applications provides students with a current look at Digital Filter Design and Signal Processing. Key Features: New! Chapter 9 is new to this edition and is dedicated to z-transforms, the math needed for engineering applications such as Digital Filter Design and Signal Processing. The text models good proofs and guides students through the details. Exercise sets offer a wide variety of choices for computational skills, theoretical understanding, and applications. Applications show how complex analysis is used in science and engineering. Illustrations include the z-transform, ideal fluid flow, steady-state temperatures, and electrostatics. Coverage of Julia and Mandelbrot sets. Interactive website includes bibliographical library resources, undergraduate research, and complementary software using F(Z)[Trademark], Mathematica[Trademark], and Maple[Trademark]. Solutions to odd-numbered problem assignments are included as an appendix. Book jacket.

Ideal for a first course in complex analysis, this book can be used either as a classroom text or for independent study. Written at a level accessible to advanced undergraduates and beginning graduate students, the book is suitable for readers acquainted with advanced calculus or introductory real analysis. The treatment goes beyond the standard material of power series, Cauchy's theorem, residues, conformal mapping, and harmonic functions by including accessible discussions of intriguing topics that are uncommon in a book at this level. The flexibility afforded by the supplementary topics and applications makes the book adaptable either to a short, one-term course or to a comprehensive, full-year course. Detailed solutions of the exercises both serve as models for students and facilitate independent study. Supplementary exercises, not solved in the book, provide an additional teaching tool.

Introductory Complex AnalysisCourier Corporation

The theory of functions of a complex variable is a central theme in mathematical analysis that has links to several branches of mathematics. Understanding the basics of the theory is necessary for anyone interested in general mathematical training or for anyone who wants to use mathematics in applied sciences or technology. The book presents the basic theory of analytic functions of a complex variable and their points of contact with other parts of mathematical analysis. This results in some new approaches to a number of topics when compared to the current literature on the subject. Some issues covered are: a real version of the Cauchy-Goursat theorem, theorems of vector analysis with weak regularity assumptions, an approach to the concept of holomorphic functions of real variables, Green's formula with multiplicities, Cauchy's theorem for locally exact forms, a study in parallel of Poisson's equation and the inhomogeneous Cauchy-Riemann equations, the relationship between Green's function and conformal mapping, the connection between the solution of Poisson's equation and zeros of holomorphic functions, and the Whittaker-Shannon theorem of information theory. The text can be used as a manual for complex variable courses of various levels and as a reference book. The only prerequisite is a working knowledge of the topology of the plane and the differential calculus for functions of several real variables. A detailed treatment of harmonic functions also makes the book useful as an introduction to potential theory.

This volume presents a collection of contributions to an international conference on complex analysis and its applications held at the newly founded Hong Kong University of Science and Technology in January 1993. The aim of the conference was to advance the theoretical aspects of complex analysis and to explore the application of its techniques to physical and engineering problems. Three main areas were emphasised: Value distribution theory; Complex dynamical system and geometric function theory; and the Application of complex analysis to differential quations and physical engineering problems.

International Series of Monographs in Pure and Applied Mathematics, Volume 86, Some Topics in Complex Analysis deals with a variety of topics related to complex analysis. This book discusses the method of comparison, periods of an integral, generalized Joukowski transformations, and Koebe's distortion theorems. The deductions from the maximum-modulus principle, canonical products and genus of an I.F., and Weierstrass's primary factors are also reviewed. This text likewise considers Mittag-Leffler's theorem, summation of series by the calculus of residues, definition of regular functions by integrals, and Riemann zeta function. This publication is a good reference for students and specialists researching in the field of applied and pure mathematics.

Complex analysis is a cornerstone of mathematics, making it an essential element of any area of study in graduate mathematics. Schlag's treatment of the subject emphasizes the intuitive geometric underpinnings of elementary complex analysis that naturally lead to the theory of Riemann surfaces. The book begins with an exposition of the basic theory of holomorphic functions of one complex variable. The first two chapters constitute a fairly rapid, but comprehensive course in complex analysis. The third chapter is devoted to the study of harmonic functions on the disk and the half-plane, with an emphasis on the Dirichlet problem. Starting with the fourth chapter, the theory of Riemann surfaces is developed in some detail and with complete rigor. From the beginning, the geometric aspects are emphasized and classical topics such as elliptic functions and elliptic integrals are presented as illustrations of the abstract theory. The special role of compact Riemann surfaces is explained, and their connection with algebraic equations is established. The book concludes with three chapters devoted to three major results: the Hodge decomposition theorem, the Riemann-Roch theorem, and the uniformization theorem. These chapters present the core technical apparatus of Riemann surface theory at this level. This text is intended as a detailed, yet fast-paced intermediate introduction to those parts of the theory of one complex variable that seem most useful in other areas of mathematics, including geometric group theory, dynamics, algebraic geometry, number theory, and functional analysis. More than seventy figures serve to illustrate concepts and ideas, and the many problems at the end of each chapter give the reader ample opportunity for practice and independent study.

Presents the basic techniques and theorems of analysis. This work includes a chapter on differentiation. It presents proofs of theorems and many exercises appear at the end of each chapter. It is arranged so that each chapter builds upon the other, giving students a gradual understanding of the subject.

An Introduction to Complex Analysis and Geometry provides the reader with a deep appreciation of complex analysis and how this subject fits into mathematics. The book developed from courses given in the Campus Honors Program at the University of Illinois Urbana-Champaign. These courses aimed to share with students the way many mathematics and physics problems magically simplify when viewed from the perspective of complex analysis. The book begins at an elementary level but also contains advanced material. The first four chapters provide an introduction to complex analysis with many elementary and unusual applications. Chapters 5 through 7 develop the Cauchy theory and include some striking applications to calculus. Chapter 8 glimpses several appealing topics, simultaneously unifying the book and opening the door to further study. The 280 exercises range from simple computations to difficult problems. Their variety makes the book especially attractive. A reader of the first four chapters will be able to apply complex numbers in many elementary contexts. A reader of the full book will know basic one complex variable theory and will have seen it integrated into mathematics as a whole. Research mathematicians will discover several novel perspectives.

Text for advanced undergraduates and graduate students provides geometrical insights by covering angles, basic complex analysis, and interactions with plane topology while focusing on concepts of angle and winding numbers. 1979 edition.

This carefully written textbook is an introduction to the beautiful concepts and results of complex analysis. It is intended for international bachelor and master programmes in Germany and throughout Europe; in the Anglo-American system of university education the content corresponds to a beginning graduate course. The book presents the fundamental results and methods of complex analysis and applies them to a study of elementary and non-elementary functions (elliptic functions, Gamma- and Zeta function including a proof of the prime number theorem ...) and – a new feature in this context! – to exhibiting basic facts in the theory of several complex variables. Part of the book is a translation of the authors' German text "Einführung in die komplexe Analysis"; some material was added from the by now almost "classical" text "Funktionentheorie" written by the authors, and a few paragraphs were newly written for special use in a master's programme.

The basics of what every scientist and engineer should know, from complex numbers, limits in the complex plane, and complex functions to Cauchy's theory, power series, and applications of residues. 1974 edition.

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.