Complex Analysis For Mathematics And Engineering

This textbook introduces the subject of complex analysis to advanced undergraduate and graduate students in a clear and concise manner. Key features of this textbook: effectively organizes the subject into easily manageable sections in the form of 50 class-tested lectures, uses detailed examples to drive the presentation, includes numerous exercise sets that encourage pursuing extensions of the material, each with an "Answers or Hints" section, covers an array of advanced topics which allow for flexibility in developing the subject beyond the basics, provides a concise history of complex numbers. An Introduction to Complex Analysis will be valuable to students in mathematics, engineering and other applied sciences. Prerequisites include a course in calculus.

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 original edition of this book has been out of print for some years. The appear ance of the present second edition owes much to the initiative of Yves Nievergelt at Eastern Washington University, and the support of Ann Kostant, Mathematics Editor at Birkhauser. Since the book was first published, several people have remarked on the absence of exercises and expressed the opinion that the book would have been more useful had exercises been included. In 1997, Yves Nievergelt informed me that, for a decade, he had regularly taught a course at Eastern Washington based on the book, and that he had systematically compiled exercises for his course. He kindly put his work at my disposal. Thus, the present edition appears in two parts. The first is essentially just a reprint of the original edition. I have corrected the misprints of which I have become aware (including those pointed out to me by others), and have made a small number of other minor changes.

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.

Complex Analysis in One Variable

Complex Analysis

A Complex Analysis Problem Book

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.

The new Second Edition of A First Course in Complex Analysis with Applications is a truly accessible introduction to the fundamental principles and applications of complex analysis. Designed for the undergraduate student with a calculus background but no prior experience with complex variables, this text discusses theory of the most relevant mathematical topics in a student-friendly manner. With Zill's clear and straightforward writing style, concepts are introduced through numerous examples and clear illustrations. 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 on the applications of complex variables, providing students with the opportunity to develop a practical and clear understanding of complex analysis.

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.

This second edition of Priestley's well-known text is aimed at students taking an introductory core course in Complex Analysis, a classical and central area of mathematics.

An Introduction to The Theory of Analytic Functions of One Complex Variable

Complex Analysis with Applications

In the Spirit of Lipman Bers

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.

The book discusses major topics in complex analysis with applications to number theory. This book is intended as a text for graduate students of mathematics and undergraduate students of engineering, as well as to researchers in complex analysis and number theory. This theory is a prerequisite for the study of many areas of mathematics, including the theory of several finitely and infinitely many complex variables, hyperbolic geometry, two and three manifolds and number theory. In additional to solved examples and problems, the book covers most of the topics of current interest, such as Cauchy theorems, Picard's theorems, Riemann–Zeta function, Dirichlet theorem, gamma function and harmonic functions.

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.

This book discusses all the major topics of complex analysis, beginning with the properties of complex numbers and ending with the proofs of the fundamental principles of conformal mappings. Topics covered in the book include the study of holomorphic and analytic functions, classification of singular points and the Laurent series expansion, theory of residues and their application to evaluation of integrals, systematic study of elementary functions, analysis of conformal mappings and their applications--making this book self-sufficient and the reader independent of any other texts on complex variables. The book is aimed at the advanced undergraduate students of mathematics and engineering, as well as those interested in studying complex analysis with a good working knowledge of advanced calculus. The mathematical level of the exposition corresponds to advanced undergraduate courses of mathematical analysis and first graduate introduction to the discipline. The book contains a large number of problems and exercises, making it suitable for both classroom use and self-study. Many standard exercises are included in each section to develop basic skills and test the understanding of concepts. Other problems are more theoretically oriented and illustrate intricate points of the theory. Many additional problems are proposed as homework tasks whose level ranges from straightforward, but not overly simple, exercises to problems of considerable difficulty but of comparable interest.

Introductory Complex Analysis

A Second Course in Complex Analysis

A Collection of Problems on Complex Analysis

The Second Edition of this acclaimed text helps you apply theory to real-world applications in mathematics, physics, and engineering. It easily guides you through complex analysis with its excellent coverage of topics such as series, residues, and the evaluation of integrals; multi-valued functions; conformal mapping; dispersion relations; and analytic continuation. Worked examples plus a large number of assigned problems help you understand how to apply complex concepts and build your own skills by putting them into practice. This edition features many new problems, revised sections, and an entirely new chapter on analytic continuation.

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.

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.

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.

Fundamentals of Complex Analysis for Mathematics, Science, and Engineering

A First Course

Elementary Real and Complex Analysis

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.

The aim of this comparatively short textbook is a sufficiently full exposition of the fundamentals of the theory of functions of a complex variable to prepare the student for various applications. Several important applications in physics and engineering are considered in the book. This thorough presentation includes all theorems (with a few exceptions) presented with proofs. No previous exposure to complex numbers is assumed. The textbook can be used in one-semester or two-semester courses. In one respect this book is larger than usual, namely in the number of detailed solutions of typical problems. This, together with various problems, makes the book useful both for self- study and for the instructor as well. A specific point of the book is the inclusion of the Laplace transform. These two topics are closely related. Concepts in complex analysis are needed to formulate and prove basic theorems in Laplace transforms, such as the inverse Laplace transform formula. Methods of complex analysis provide solutions for problems involving Laplace transforms. Complex numbers lend clarity and completion to some areas of classical analysis. These numbers found important applications not only in the mathematical theory, but in the mathematical descriptions of processes in physics and engineering.

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.

Complex Analysis for Mathematics and EngineeringJones & Bartlett Publishers

An Introduction to Complex Analysis and the Laplace Transform

An Introduction to Complex Analysis

Visual Complex Analysis

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.

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.

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

This book contains a history of real and complex analysis in the nineteenth century, from the work of Lagrange and Fourier to the origins of set theory and the modern foundations of analysis. It studies the works of many contributors including Gauss, Cauchy, Riemann, and Weierstrass. This book is unique owing to the treatment of real and complex analysis as overlapping, inter-related subjects, in keeping with how they were seen at the time. It is suitable as a course in the history of mathematics for students who have studied an introductory course in analysis, and will enrich any course in undergraduate real or complex analysis.

Real and Complex Analysis

Explorations in Complex Analysis

Classical Complex Analysis

A standard source of information of functions of one complex variable, this text has retained its wide popularity in this field by being consistently rigorous without becoming needlessly concerned with advanced or overspecialized material. Difficult points have been clarified, the book has been reviewed for accuracy, and notations and terminology have been modernized. Chapter 2, Complex Functions, features a brief section on the change of length and area under conformal mapping, and much of Chapter 8, Global-Analytic Functions, has been rewritten in order to introduce readers to the terminology of germs and sheaves while still emphasizing that classical concepts are the backbone of the theory. Chapter 4, Complex Integration, now includes a new and simpler proof of the general form of Cauchy's theorem. There is a short section on the Riemann zeta function, showing the use of residues in a more exciting situation than in the computation of definite integrals.

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.

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.

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.

Twenty-One Lectures on Complex Analysis

An Introduction to Complex Analysis and Geometry

Complex Analysis for Mathematics and Engineering

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.

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 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.

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.

A First Course in Complex Analysis with Applications

A Modern First Course in Function Theory

The Real and the Complex: A History of Analysis in the 19th Century

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 unusual and lively textbook offers a clear and intuitive approach to the classical and beautiful theory of complex variables. With very little dependence on advanced concepts from several-variable calculus and topology, the text focuses on the authentic complex-variable ideas and techniques. Accessible to students at their early stages of mathematical study, this full first year course in complex analysis offers new and interesting motivations for classical results and introduces related topics stressing motivation and technique. Numerous illustrations, examples, and now 300 exercises, enrich the text. Students who master this textbook will emerge with an excellent grounding in complex analysis, and a solid understanding of its wide applicability.

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.

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

Complex Analysis with Applications in Science and Engineering

Complex Analysis with Applications to Number Theory

Modern Real and Complex Analysis

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.*

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.

A Course in Complex Analysis and Riemann Surfaces

Introduction to Complex Analysis