The Residue Theorem And Its Applications

This textbook is intended for a one semester course in complex analysis for upper level undergraduates in mathematics. Applications, primary motivations for this text, are presented hand-in-hand with theory enabling this text to serve well in courses for students in engineering or applied sciences. The overall aim in designing this text is to accommodate students of different mathematical backgrounds and to achieve a balance between presentations of rigorous mathematical proofs and applications. The text is adapted to enable maximum flexibility to instructors and to students who may also choose to progress through the material outside of coursework. Detailed examples may be covered in one course, giving the instructor the option to choose those that are best suited for discussion. Examples showcase a variety of problems with completely worked out solutions, assisting students in working through the exercises. The numerous exercises vary in difficulty from simple applications of formulas to more advanced project-type problems. Detailed hints accompany the more challenging problems. Multi-part exercises may be assigned to individual students, to groups as projects, or serve as further illustrations for the instructor. Widely used graphics clarify both concrete and abstract concepts, helping students visualize the proofs of many results. Freely accessible solutions to every-other-odd exercise are posted to the book's Springer website. Additional solutions for instructors' use may be obtained by contacting the authors directly.

This book is based on lectures presented over many years to second and third year mathematics students in the Mathematics Departments at Bedford College, London, and King's College, London, as part of the BSc. and MSci. program. Its aim is to provide a gentle yet rigorous first course on complex analysis.Metric space aspects of the complex plane are discussed in detail, making this text an excellent introduction to metric space theory. The complex exponential and trigonometric functions are defined from first principles and great care is taken to derive their familiar properties. In particular, the appearance of ?, in this context, is carefully explained.The central results of the subject, such as Cauchy's Theorem and its immediate corollaries, as well as the theory of singularities and the Residue Theorem are carefully treated while avoiding overly complicated generality. Throughout, the theory is illustrated by examples.A number of relevant results from real analysis are collected, complete with proofs, in an appendix.The approach in this book attempts to soften the impact for the student who may feel less than completely comfortable with the logical but often overly concise presentation of mathematical analysis elsewhere.

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.

Introduction to Complex Analysis

Handbook of Complex Variables

The Ring of Malcev-Neumann Series and the Residue Theorem

A Course of Modern Analysis

Complex Analysis with Applications

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.

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.

Growing specialization and diversification have brought a host of monographs and textbooks on increasingly specialized topics. However, the "tree" of knowledge of mathematics and related fields does not' grow only by putting forth new branches. It also happens, quite often in fact, that branches which were thought to be completely disparate are suddenly seen to be related. Further, the kind and level of sophistication of mathematics applied in various sciences has changed drastically in recent years: measure theory is used (non-trivially) in regional and theoretical economics; algebraic geometry interacts with physics; the Minkowsky lemma, coding theory arid the struc ture of water meet one another in packing and covering theory; quantum fields, crystal defects and mathematical programming profit from homotopy theory; lie algebras are relevant to filtering; and prediction and electrical engineering can use Stein spaces. And in addition to this there are such new emerging subdisciplines as "completely integrable systems", "chaos, synergetics and large-5cale order", which are almost impossible to fit into the existing classification schemes. They draw upon widely different sections of mathematics. This program, Mathematics and Its Applications, is devoted to such (new) interrelations as exampla gratia: - a central concept which plays an important role in several different mathe matical and/or scientific specialized areas; - new applications of the results and ideas from one area of scientific en deavor into another; - influences which the results, problems and concepts of one field of enquiry have and have had on the development of another.

Some General Theorems for Evaluating Definite Integrals by Cauchy's Residue Theorem

Homology, hyperfunctions and microlocal analysis

Applications of the Residue Theorem

Symbolic Computing Applications in Maple and Mathematica

The Calculus of Residues and Its Application to the Evaluation of Definite Integrals...

This book is written to be a convenient reference for the working scientist, student, or engineer who needs to know and use basic concepts in complex analysis. It is not a book of mathematical theory. It is instead a book of mathematical practice. All the basic ideas of complex analysis, as well as many typical applica tions, are treated. Since we are not developing theory and proofs, we have not been obliged to conform to a strict logical ordering of topics. Instead, topics have been organized for ease of reference, so that cognate topics appear in one place. Required background for reading the text is minimal: a good ground ing in (real variable) calculus will suffice. However, the reader who gets maximum utility from the book will be that reader who has had a course in complex analysis at some time in his life. This book is a handy com pendium of all basic facts about complex variable theory. But it is not a textbook, and a person would be hard put to endeavor to learn the subject by reading this book.

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.

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

A First Course in Complex Analysis

Theory and Applications

A First Course on Complex Functions

A Complex Analysis Problem Book

Lecture Notes On Complex Analysis

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.

Explores the interrelations between real and complex numbers by adopting both generalization and specialization methods to move between them, while simultaneously examining their analytic and geometric characteristics Engaging exposition with discussions, remarks, questions, and exercises to motivate understanding and critical thinking skills Encludes numerous examples and applications relevant to science and engineering students

This practical treatment explains the applications complex calculus without requiring the rigor of a real analysis background. The author explores algebraic and geometric aspects of complex numbers, differentiation, contour integration, finite and infinite real integrals, summation of series, and the fundamental theorem of algebra. The Residue Theo

An Introduction to the General Theory of Infinite Series and of Analytic Functions, with an Account of the Principal Transcendental Functions

Mathematics for Physical Science and Engineering

Complex Analysis

(AMS-200)

Complex Analysis with Applications in Science and Engineering

Complex analysis is one of the most attractive of all the core topics in an undergraduate mathematics course. Its importance to applications means that it can be studied both from a very pure perspective and a very applied perspective. This book takes account of these varying needs and backgrounds and provides a self-study text for students in mathematics, science and engineering. Beginning with a summary of what the student needs to know at the outset, it covers all the topics likely to feature in a first course in the subject, including: complex numbers, differentiation, integration, Cauchy's theorem, and its consequences, Laurent series and the residue theorem, applications of contour integration, conformal mappings, and harmonic functions. A brief final chapter explains the Riemann hypothesis, the most celebrated of all the unsolved problems in mathematics, and ends with a short descriptive account of iteration, Julia sets and the Mandelbrot set. Clear and careful explanations are backed up with worked examples and more than 100 exercises, for which full solutions are provided.

Mathematics for Physical Science and Engineering is a complete text in mathematics for physical science that includes the use of symbolic computation to illustrate the mathematical concepts and enable the solution of a broader range of practical problems. This book enables professionals to connect their knowledge of mathematics to either or both of the symbolic languages Maple and Mathematica. The book begins by introducing the reader to symbolic computation and how it can be applied to solve a broad range of practical problems. Chapters cover topics that include: infinite series; complex numbers and functions; vectors and matrices; vector analysis; tensor analysis; ordinary differential equations; general vector spaces; Fourier series; partial differential equations; complex variable theory; and probability and statistics. Each important concept is clarified to students through the use of a simple example and often an illustration. This book is an ideal reference for upper level undergraduates in physical chemistry, physics, engineering, and advanced/applied mathematics courses. It will also appeal to graduate physicists, engineers and related specialties seeking to address practical problems in physical science. Clarifies each important concept to students through the use of a simple example and often an illustration Provides quick-reference for students through multiple appendices, including an overview of terms in most commonly used applications (Mathematica, Maple) Shows how symbolic computing enables solving a broad range of practical problems

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.

Singularities of integrals

Introductory Complex Analysis

The Cauchy Method of Residues

Complex Variables

Calculus with Complex Numbers

Cauchy's Residue Theorem and ApplicationComplex AnalysisSpringer Science & Business Media

This volume collects presentations from the international workshop on local cohomology held in Guanajuato, Mexico, including expanded lecture notes of two minicourses on applications in equivariant topology and foundations of duality theory, and chapters on finiteness properties, D-modules, monomial ideals, combinatorial analysis, and related topics. Featuring selected papers from renowned experts around the world, Local Cohomology and Its Applications is a provocative reference for algebraists, topologists, and upper-level undergraduate and graduate students in these disciplines.

A shorter version of A. I. Markushevich's masterly three-volume Theory of Functions of a Complex Variable, this edition is appropriate for advanced undergraduate and graduate courses in complex analysis. Numerous worked-out examples and more than 300 problems, some with hints and answers, make it suitable for independent study. 1967 edition.

Cauchy's Residue Theorem and Application

On the Theory and Applications of Cauchy's Residue Theorem

Plane Algebraic Curves

A Thesis

Elementary Theory of Analytic Functions of One or Several Complex Variables

In a detailed and comprehensive introduction to the theory of plane algebraic curves, the authors examine this classical area of mathematics that both figured prominently in ancient Greek studies and remains a source of inspiration and a topic of research to this day. Arising from notes for a course given at the University of Bonn in Germany, " Plane Algebraic Curves " reflects the authors ' concern for the student audience through its emphasis on motivation, development of imagination, and understanding of basic ideas. As classical objects, curves may be viewed from many angles. This text also provides a foundation for the comprehension and exploration of modern work on singularities. --- In the first chapter one finds many special curves with very attractive geometric presentations – the wealth of illustrations is a distinctive characteristic of this book – and an introduction to projective geometry (over the complex numbers). In the second chapter one finds a very simple proof of Bezout ' s theorem and a detailed discussion of cubics. The heart of this book – and how else could it be with the first author – is the chapter on the resolution of singularities (always over the complex numbers). (...) Especially remarkable is the outlook to further work on the topics discussed, with numerous references to the literature. Many examples round off this successful representation of a classical and yet still very much alive subject. (Mathematical Reviews)

A First Course in Complex Analysis was developed from lecture notes for a one-semester undergraduate course taught by the authors. For many students, complex analysis is the first rigorous analysis (if not mathematics) class they take, and these notes reflect this. The authors try to rely on as few concepts from real analysis as possible. In particular, series and sequences are treated from scratch.

This book constitutes the refereed proceedings of the 7th International Conference on Interactive Theorem Proving, ITP 2016, held in Nancy, France, in August 2016. The 27 full papers and 5 short papers presented were carefully reviewed and selected from 55 submissions. The topics range from theoretical foundations to implementation aspects and applications in program verification, security and formalization of mathematical theories.

Interactive Theorem Proving

Complex Variables with Applications

Complex Variables and Applications

Second Edition

Certain Applications of the Cauchy Residue Theorem

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.

Topics include the complex plane, basic properties of analytic functions, analytic functions as mappings, analytic and harmonic functions in applications, transform methods. Hundreds of solved examples, exercises, applications. 1990 edition. Appendices.

This book presents the complete proof of the Bloch-Kato conjecture and several related conjectures of Beilinson and Lichtenbaum in algebraic geometry. Brought together here for the first time, these conjectures describe the structure of é tale cohomology and its relation to motivic cohomology and Chow groups. Although the proof relies on the work of several people, it is credited primarily to Vladimir Voevodsky. The authors draw on a multitude of published and unpublished sources to explain the large-scale structure of Voevodsky ' s proof and introduce the key figures behind its development. They proceed to describe the highly innovative geometric constructions of Markus Rost, including the construction of norm varieties, which play a crucial role in the proof. The book then addresses symmetric powers of motives and motivic cohomology operations. Comprehensive and self-contained, The Norm Residue Theorem in Motivic Cohomology unites various components of the proof that until now were scattered across many sources of varying accessibility, often with differing hypotheses, definitions, and language.

Translated by John Stillwell

Cauchy and the Creation of Complex Function Theory

7th International Conference, ITP 2016, Nancy, France, August 22-25, 2016, Proceedings

Construction of Branch Cuts, the Residue Theorem and Applications

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.

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.

Bringing together two fundamental texts from Frédéric Pham's research on singular integrals, the first part of this book focuses on topological and geometrical aspects while the second explains the analytic approach. Using notions developed by J. Leray in the calculus of residues in several variables and R. Thom's isotopy theorems, Frédéric Pham's foundational study of the singularities of integrals lies at the interface between analysis and algebraic geometry, culminating in the Picard-Lefschetz formulae. These mathematical structures, enriched by the work of Nilsson, are then approached using methods from the theory of differential equations and generalized from the point of view of hyperfunction theory and microlocal analysis. Providing a 'must-have' introduction to the singularities of integrals, a number of supplementary references also offer a convenient guide to the subjects covered. This book will appeal to both mathematicians and physicists with an interest in the area of singularities of integrals. Frédéric Pham, now retired, was Professor at the University of Nice. He has published several educational and research texts. His recent work concerns semi-classical analysis and resurgent functions.

The Norm Residue Theorem in Motivic Cohomology

Local Cohomology and Its Applications

This book contains a rigorous coverage of those topics (and only those topics) that, in the author's judgement, are suitable for inclusion in a first course on Complex Functions. Roughly speaking, these can be summarized as being the things that can be done with Cauchy's integral formula and the residue theorem. On the theoretical side, this includes the basic core of the theory of differentiable complex functions, a theory which is unsurpassed in Mathematics for its cohesion, elegance and wealth of surprises. On the practical side, it includes the computational applications of the residue theorem. Some prominence is given to the latter, because for the more sceptical student they provide the justification for inventing the complex numbers. Analytic continuation and Riemann surfaces form an essentially different chapter of Complex Analysis. A proper treatment is far too sophisticated for a first course, and they are therefore excluded. The aim has been to produce the simplest possible rigorous treatment of the topics discussed. For the programme outlined above, it is quite sufficient to prove Cauchy'S integral theorem for paths in star-shaped open sets, so this is done. No form of the Jordan curve theorem is used anywhere in the book.