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COMPLEX ANALYSIS

Complex Analysis *Princeton University*

Press

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.

Theory of Functions of a Complex Variable, Vol 1 *American Mathematical Soc.*

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

Complex Analysis through Examples and Exercises *Springer Science & Business Media*

The book *Complex Analysis through Examples and Exercises* has come out from the lectures and exercises that the author held mostly for mathematician and physicists. The book is an attempt to present the rather involved subject of complex analysis through an active approach by the reader. Thus this book is a complex combination of theory and examples. Complex analysis is involved in all branches of mathematics. It often happens that the complex analysis is the shortest path for solving a problem in real circumstances. We are using the (Cauchy) integral approach and the (Weierstrass) power series approach. In the theory of complex analysis, on the one hand one has an interplay of several mathematical disciplines, while on the other various methods, tools, and approaches. In view of that, the exposition of new notions and methods in our book is taken step by step. A minimal amount of expository theory is included at the beginning of each section,

the Preliminaries, with maximum effort placed on well selected examples and exercises capturing the essence of the material. Actually, I have divided the problems into two classes called Examples and Exercises (some of them often also contain proofs of the statements from the Preliminaries). The examples contain complete solutions and serve as a model for solving similar problems given in the exercises. The readers are left to find the solution in the exercises; the answers, and, occasionally, some hints, are still given.

Complex Analysis *McGraw-Hill Science Engineering*

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.

Complex Analysis *Springer Science & Business Media*

Organizing the basic material of complex analysis in a unique manner, the authors of this versatile book aim is to present a precise and concise treatment of those parts of complex analysis that should be familiar to every research mathematician.

Complex Analysis *Jones & Bartlett Publishers*

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. -

Complex Analysis in one Variable *Springer Science & Business Media*

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 mathematics 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 available 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.

Complex Analysis with Applications *Springer*

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.

Elementary Theory of Analytic Functions of One or Several Complex Variables *Courier Corporation*

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.

Introduction to Topological Manifolds *Springer Science & Business Media*

Manifolds play an important role in topology, geometry, complex analysis, algebra, and classical mechanics. Learning manifolds differs from most

other introductory mathematics in that the subject matter is often completely unfamiliar. This introduction guides readers by explaining the roles manifolds play in diverse branches of mathematics and physics. The book begins with the basics of general topology and gently moves to manifolds, the fundamental group, and covering spaces.

Function Theory of One Complex Variable *American Mathematical Soc.*

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.

Real Analysis: A Comprehensive Course in Analysis, Part 1 *American*

Mathematical Soc.

A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional bonus information, including hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis. Part 1 is devoted to real analysis. From one point of view, it presents the infinitesimal calculus of the twentieth century with the ultimate integral calculus (measure theory) and the ultimate differential calculus (distribution theory). From another, it shows the triumph of abstract spaces: topological spaces, Banach and Hilbert spaces, measure spaces, Riesz spaces, Polish spaces, locally convex spaces, Fréchet spaces, Schwartz space, and spaces. Finally it is the study of big techniques, including the Fourier series and transform, dual spaces, the Baire category, fixed point theorems, probability ideas, and Hausdorff dimension. Applications include the constructions of nowhere differentiable functions, Brownian motion, space-filling curves, solutions of the moment problem, Haar measure, and equilibrium measures in potential theory.

Complex Analysis *Springer Science & Business Media*

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.

Nevanlinna Theory, Normal Families, and Algebraic Differential Equations *Springer*

This book offers a modern introduction to Nevanlinna theory and its intricate relation to the theory of normal families, algebraic functions, asymptotic series, and algebraic differential equations. Following a comprehensive treatment of Nevanlinna's theory of value distribution, the author presents advances made since Hayman's work on the value distribution of differential polynomials and illustrates how value- and pair-sharing problems are linked to algebraic curves and Briot-Bouquet differential equations. In addition to discussing classical applications of Nevanlinna theory, the book outlines state-of-the-art research, such as the effect of the Yosida and Zalcman-Pang method of re-scaling to algebraic differential equations, and presents the Painlevé-Yosida theorem, which relates Painlevé transcendents and solutions to selected 2D Hamiltonian systems to certain Yosida classes of meromorphic functions. Aimed at graduate students interested in recent developments in the field and researchers working on related problems, Nevanlinna Theory, Normal Families, and Algebraic Differential Equations will also be of interest to complex analysts looking for an introduction to various topics in the subject area. With examples, exercises and proofs seamlessly intertwined with the body of the text, this book is particularly suitable for the more advanced reader.

Functions of One Complex Variable I *Springer Science & Business Media*

"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

Complex Analysis *Walter de Gruyter GmbH & Co KG*

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 first 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 $\bar{\partial}$ -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 $\bar{\partial}$ -complex The twisted $\bar{\partial}$ -complex and Schrödinger operators

The Numerical Solution of Elliptic Equations *SIAM*

A concise survey of the current state of knowledge in 1972 about solving elliptic boundary-value eigenvalue problems with the help of a computer. This volume provides a case study in scientific computing—the art of utilizing physical intuition, mathematical theorems and algorithms, and modern computer technology to construct and explore realistic models of problems arising in the natural sciences and engineering.

Complex Analysis *Springer Science & Business Media*

The present book is meant as a text for a course on complex analysis at the advanced undergraduate level, or first-year graduate level. Somewhat more material has been included than can be covered at leisure in one term, to give opportunities for the instructor to exercise his taste, and lead the course in whatever direction strikes his fancy at the time. A large number of routine exercises are included for the more standard portions, and a few harder exercises of striking theoretical interest are also included, but may be omitted in courses addressed to less advanced students. In some sense, I think the classical German prewar texts were the best (Hurwitz-Courant, Knopp, Bieberbach, etc.) and I would recommend to anyone to look through them. More recent texts have emphasized connections with real analysis, which is important, but at the cost of exhibiting succinctly and clearly what is peculiar about complex analysis: the power series expansion, the uniqueness of analytic continuation, and the calculus of residues. The systematic elementary development of formal and convergent power series was standard fare in the German texts, but only Cartan, in the more recent books, includes this

material, which I think is quite essential, e. g. , for differential equations. I have written a short text, exhibiting these features, making it applicable to a wide variety of tastes. The book essentially decomposes into two parts.

Complex Variables with Applications

Springer Science & Business Media

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 Enclodes numerous examples and applications relevant to science and engineering students

The William Lowell Putnam Mathematical Competition Problems and Solutions

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Complex Analysis

Springer Science & Business Media

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.

Dirichlet's Problem

Complex Function Theory

American Mathematical Soc.

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.

Complex Analysis

Walter de Gruyter GmbH & Co KG

This book is an in-depth and modern presentation of important classical results in complex analysis and is suitable for a first course on the topic, as taught by the authors at several universities. The level of difficulty of the material increases gradually from chapter to chapter, and each chapter contains many exercises with solutions

and applications of the results, with the particular goal of showcasing a variety of solution techniques.

Basic Complex Analysis *Macmillan*

Basic Complex Analysis skillfully combines a clear exposition of core theory with a rich variety of applications. Designed for undergraduates in mathematics, the physical sciences, and engineering who have completed two years of calculus and are taking complex analysis for the first time..

Complex Analysis *Springer Science & Business Media*

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

Complex Analysis and Dynamical Systems VI *American Mathematical Soc.*

This volume contains the proceedings of the Sixth International Conference on Complex Analysis and Dynamical Systems, held from May 19–24, 2013, in Nahariya, Israel, in honor of David Shoikhet's sixtieth birthday. The papers range over a wide variety of topics in complex analysis, quasiconformal mappings, and complex dynamics. Taken together, the articles provide the reader with a panorama of activity in these areas, drawn by a number of leading figures in the field. They testify to the continued vitality of the interplay between classical and modern analysis. The companion volume (Contemporary Mathematics, Volume 653) is devoted to

partial differential equations, differential geometry, and radon transforms.

Complex Analysis - Fifth Romanian-Finnish Seminar. Proceedings of the Seminar Held in Bucharest, June 28 - July 3, 1981 *Springer*

Foundations of Functional Analysis *Alpha Science Int'l Ltd.*

Provides fundamental concepts about the theory, application and various methods involving functional analysis for students, teachers, scientists and engineers. Divided into three parts it covers: Basic facts of linear algebra and real analysis. Normed spaces, contraction mappings, linear operators between normed spaces and fundamental results on these topics. Hilbert spaces and the representation of continuous linear function with applications. In this self-contained book, all the concepts, results and their consequences are motivated and illustrated by numerous examples in each chapter with carefully chosen exercises.

Invitation to Complex Analysis

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.

A First Course in Complex Analysis with Applications *Jones & Bartlett Learning*

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.

Linear and Complex Analysis for Applications *CRC Press*

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.

Complex Analysis and Potential Theory *World Scientific*

This volume gathers the contributions from outstanding mathematicians, such as Samuel Krushkal, Reiner Kuhnau, Chung Chun Yang, Vladimir Miklyukov and others. It will help researchers to solve problems on complex analysis and potential theory and discuss various applications in engineering. The

contributions also update the reader on recent developments in the field. Moreover, a special part of the volume is completely devoted to the formulation of some important open problems and interesting conjectures.

Functions of a Complex Variable *SIAM*

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.

Complex Analysis and Potential Theory

Advanced Methods for the Solution of Differential Equations

Conformal Invariants *American Mathematical Soc.*

Most conformal invariants can be

described in terms of extremal properties. Conformal invariants and extremal problems are therefore intimately linked and form together the central theme of this classic book which is primarily intended for students with approximately a year's background in complex variable theory. The book emphasizes the geometric approach as well as classical and semi-classical results which Lars Ahlfors felt every student of complex analysis should know before embarking on independent research. At the time of the book's original appearance, much of this material had never appeared in book form, particularly the discussion of the theory of extremal length. Schiffer's variational method also receives special attention, and a proof of $|\operatorname{ver} a_4| \leq 4$ is included which was new at the time of publication. The last two chapters give an introduction to Riemann surfaces, with topological and analytical background supplied to support a proof of the uniformization theorem. Included in this new reprint is a Foreword by Peter Duren, F. W. Gehring, and Brad Osgood, as well as an extensive errata. ... encompasses a wealth of material in a mere one hundred and fifty-one pages. Its purpose is to present an exposition of selected topics in the geometric theory of functions of one complex variable, which in the author's opinion should be known by all prospective workers in complex analysis. From a methodological point of view the approach of the book is dominated by the notion of conformal invariant and concomitantly by extremal considerations. ... It is a splendid offering. --Reviewed for Math Reviews by M. H. Heins in 1975

Geometric Analysis *American*

Mathematical Soc.

This volume contains research and expository articles from the courses and talks given at the RSME Lluís A. Santaló Summer School, "Geometric Analysis", held June 28-July 2, 2010, in Granada, Spain. The goal of the Summer School was to present some of the many advances currently taking place in the interaction between partial differential equations and differential geometry, with special emphasis on the theory of minimal surfaces. This volume includes expository articles about the current state of specific problems involving curvature and partial differential equations, with interactions to neighboring fields such as probability. An introductory, mostly self-contained course on constant mean curvature surfaces in Lie groups equipped with a left invariant metric is provided. The volume will be of interest to researchers, post-docs, and advanced PhD students in the interface between partial

differential equations and differential geometry.

Fundamentals of Complex Analysis

Pearson Higher Ed

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. This is the best seller in this market. It provides a comprehensive introduction to complex variable theory and its applications to current engineering problems. It is designed to make the fundamentals of the subject more easily accessible to students who have little inclination to wade through the rigors of the axiomatic approach. Modeled after standard calculus books—both in level of exposition and layout—it incorporates physical applications throughout the presentation, so that the mathematical methodology appears less sterile to engineering students.