Complex Analysis With Mathematica

Complex Analysis for Science and Technology is a textbook for undergraduate and postgraduate students undertaking science, technology, engineering and mathematics (STEM) courses. The book begins with an introduction to basic complex numbers, followed by chapters covering complex functions, integrals, transformations and conformal mapping. Topics such as complex series and residue theory are also covered. Key features of this textbook include: -simple, easy-to-understand explanations of relevant concepts -a wide range of simple and complex examples -several figures where appropriate

Multivariable Calculus with Mathematica is a textbook addressing the calculus of several variables. Instead of just using Mathematica to directly solve problems, the students are encouraged to learn the syntax and to write their own code to solve problems. This not only encourages scientific computing skills but at the same time stresses the complete understanding of the mathematics. Questions are provided at the end of the chapters to test the student's theoretical understanding of the mathematics, and there are also computer algebra questions which test the student's ability to apply their knowledge in non-trivial ways. Features Ensures that students are not just using the package to directly solve problems, but learning the syntax to write their own code to solve problems Suitable as a main textbook for a Calculus III course, and as a supplementary text for topics scientific computing, engineering, and mathematical physics Written in a style that engages the students' interest and encourages the understanding of the mathematical ideas

This book presents a way of learning complex analysis, using Mathematica. Includes CD with electronic version of the book.

This book provides a systematic introduction to functions of one complex variable. Its novel feature is the consistent use of special color representations – so-called phase portraits – which visualize functions as images on their domains. Reading Visual Complex Functions requires no prerequisites except some basic knowledge of real calculus and plane geometry. The text is self-contained and covers all the main topics usually treated in a first course on complex analysis. With separate chapters on various construction principles, conformal mappings and Riemann surfaces it goes somewhat beyond a standard programme and leads the reader to more advanced themes. In a second storyline, running parallel to the course outlined above, one learns how properties of complex functions are reflected in and can be read off from phase portraits. The book contains more than 200 of these pictorial representations which endow individual faces to analytic functions. Phase portraits enhance the intuitive understanding of concepts in complex analysis and are expected to be useful tools for anybody working with special functions – even experienced researchers may be inspired by the

pictures to new and challenging questions. Visual Complex Functions may also serve as a companion to other texts or as a reference work for advanced readers who wish to know more about phase portraits.

Starting with an introduction to the numerous features of Mathematica®, this book continues with more complex material. It provides the reader with lots of examples and illustrations of how the benefits of Mathematica® can be used. Composed of eleven chapters, it includes the following: A chapter on several sorting algorithms Functions (planar and solid) with many interesting examples Ordinary differential equations Advantages of Mathematica® dealing with the Pi number The power of Mathematica® working with optimal control problems Introduction to Mathematica® with Applications will appeal to researchers, professors and students requiring a computational tool.

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.

The study of natural phenomena using computer simulation is a major new research tool in the physical, chemical, biological and social sciences. It is useful for studying simple systems, and it is essential for the study of complex systems. Using Mathematica, an integrated software environment for scientific programming, numerical analysis and visualization, this book describes computer simulations applicable to a wide range of phenomena.

The book will deal with functions of many variables: differentiation and integration, extrema with a number of digressions to related subjects such as differential equations and differential geometry of curves and surfaces. The background needed for understanding the examples and how to compute in Mathematica will also be discussed.

"Mathematica in Action, 2nd Edition," is designed both as a guide to the extraordinary capabilities of Mathematica as well as a detailed tour of modern mathematics by one of its leading expositors, Stan Wagon. Ideal for teachers, researchers, mathematica enthusiasts. This second edition of the highly sucessful W.H. Freeman version includes an 8 page full color insert and 50% new material all organized around Elementary Topics, Intermediate Applications, and Advanced Projects. In addition, the book uses Mathematica 3.0 throughtout. Mathematica 3.0 notebooks with all the programs and examples discussed in the book are available on the TELOS web site (www.telospub.com). These notebooks contain materials suitable for DOS, Windows, Macintosh and Unix computers. Stan Wagon is well-known in the mathematics (and Mathematica) community as Associate Editor of the "American Mathematical Monthly," a columnist for the "Mathematical Intelligencer" and "Mathematica in Education and Research," author of "The Banach-Tarski Paradox" and "Unsolved Problems in Elementary Geometry and Number Theory (with Victor Klee), as well as winner of the 1987 Lester R. Ford Award for Expository Writing.

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 manor. 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 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 recom mend to anyone to look through them. More recent texts have empha sized connections with real analysis, which is important, but at the cost of exhibiting succinctly and clearly what is peculiar about complex anal ysis: 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.

This supplementary text for applied mathematics courses where Mathematica is used in a laboratory setting, is intended to be compatible with a broad range of engineering mathematics texts, as well as smaller, more specialized texts in differential equations and complex variables. It covers topics found in courses on ordinary and partial differential equations, vector analysis, and applied complex analysis. Students are guided through a series of laboratory exercises that present cogent applications of the mathematics and demonstrate the use of Mathematica as a computational tool to do the mathematics. Relevant applications along with discussions of the results obtained combine to stimulate innovative thinking from the students about additional concepts and applications.

Potential theory is the broad area of mathematical analysis encompassing such topics as harmonic and subharmonic functions.

DIVExcellent 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. /div

The book constitutes a basic, concise, yet rigorous course in complex analysis, for students who have studied calculus in one and several variables, but have not previously been exposed to complex analysis. The textbook should be particularly useful and relevant for undergraduate students in joint programmes with mathematics, as well as engineering students. The aim of the book is to cover the bare bones of the subject with minimal prerequisites. The core content of the book is the three main pillars of complex analysis: the Cauchy–Riemann equations, the Cauchy Integral Theorem, and Taylor and Laurent series expansions. Each section contains several problems, which are not purely drill exercises, but are rather meant to reinforce the fundamental concepts. Detailed solutions to all the exercises appear at the end of the book, making the book ideal also for self-study. There are many figures illustrating the text. Errata(s) Errata (72 KB)

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.

This self-contained text provides an introduction to modern harmonic analysis in the context in which it is actually applied, in particular, through complex function theory and partial differential equations. It takes the novice mathematical reader from the rudiments of harmonic analysis (Fourier series) to the Fourier transform, pseudodifferential operators, and finally to Heisenberg analysis.

Riemann?Hilbert problems are fundamental objects of study within complex analysis. Many problems in differential equations and integrable systems, probability and random matrix theory, and asymptotic analysis can be solved by reformulation as a Riemann?Hilbert problem.This book, the most comprehensive one to date on the applied and computational theory of Riemann?Hilbert problems, includes an introduction to computational complex analysis, an introduction to the applied theory of Riemann?Hilbert problems from an analytical and numerical perspective, and a discussion of applications to integrable systems, differential equations, and special function theory. It also includes six fundamental examples and five more sophisticated examples of the analytical and numerical Riemann?Hilbert method, each of mathematical or physical significance or both.

Demonstrates the simplicity and effectiveness of Mathematica as the solution to practical problems in composite materials. Designed for those who need to learn how micromechanical approaches can help understand the behaviour of bodies with voids, inclusions, defects, this book is perfect for readers without a programming background. Thoroughly introducing the concept of micromechanics, it helps readers assess the deformation of solids at a localized level and analyse a body with microstructures. The author approaches this analysis using the computer algebra system Mathematica, which facilitates complex index manipulations and mathematical expressions accurately. The book begins by covering the general topics of continuum mechanics such as coordinate transformations, kinematics, stress, constitutive relationship and material symmetry. Mathematica programming is also introduced with accompanying examples. In the second half of the book, an analysis of heterogeneous materials with emphasis on composites is covered. Takes a practical approach by using Mathematica, one of the most popular programmes for symbolic computation Introduces the concept of micromechanics with worked-out examples using Mathematica

code for ease of understanding Logically begins with the essentials of the topic, such as kinematics and stress, before moving to more advanced areas Applications covered include the basics of continuum mechanics, Eshelby's method, analytical and semi-analytical approaches for materials with inclusions (composites) in both infinite and finite matrix media and thermal stresses for a medium with inclusions, all with Mathematica examples Features a problem and solution section on the book’s companion website, useful for students new to the programme

Fundamentals of analytic function theory — plus lucid exposition of 5 important applications: potential theory, ordinary differential equations, Fourier transforms, Laplace transforms, and asymptotic expansions. Includes 66 figures.

This 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.

A First Course In Complex Analysis With Applications Limits Theoretical Coverage To Only What Is Necessary, And Conveys It In A Student-Friendly Style. Its Aim Is To Introduce The Basic Principles And Applications Of Complex Analysis To Undergraduates Who Have No Prior Knowledge Of This Subject. Contents Of The Book Include The Complex Number System, Complex Functions And Sequences, As Well As Real Integrals; In Addition To Other Concepts Of Calculus, And The Functions Of A Complex Variable. This Text Is Written For Junior-Level Undergraduate Students Who Are Majoring In Math, Physics, Computer Science, And Electrical Engineering.

This volume consists of papers presented in the special sessions on "Complex and Numerical Analysis", "Value Distribution Theory and Complex Domains", and "Use of Symbolic Computation in Mathematics Education" of the ISAAC'97 Congress held at the University of Delaware, during June 2-7, 1997. The ISAAC Congress coincided with a U.S.-Japan Seminar also held at the University of Delaware. The latter was supported by the National Science Foundation through Grant INT-9603029 and the Japan Society for the Promotion of Science through Grant MTCS-134. It was natural that the participants of both meetings should interact and consequently several persons attending the Congress also presented papers in the Seminar. The success of the ISAAC Congress and the U.S.-Japan Seminar has led to the ISAAC'99 Congress being held in Fukuoka, Japan during August 1999. Many of the same participants will return to this Seminar. Indeed, it appears that the spirit of the U.S.-Japan Seminar will be continued every second year as part of the ISAAC Congresses. We decided to include with the papers presented in the ISAAC Congress and the U.S.-Japan Seminar several very good papers by colleagues from the former Soviet Union. These participants in the ISAAC Congress attended at their own expense.

For more than two thousand years some familiarity with mathematics has been regarded as an indispensable part of the intellectual equipment of every cultured person. Today the traditional place of mathematics in education is in grave danger. Unfortunately, professional representatives of mathematics share in the reponsibility. The teaching of mathematics has sometimes degen erated into empty drill in problem solving, which may develop formal ability but does not lead to real understanding or to greater intellectual indepen dence. Mathematical research has shown a tendency toward overspecialization and over-emphasis on

abstraction. Applications and connections with other fields have been neglected . . . But . . . understanding of mathematics cannot be transmitted by painless entertainment any more than education in music can be brought by the most brilliant journalism to those who never have lis tened intensively. Actual contact with the content of living mathematics is necessary. Nevertheless technicalities and detours should be avoided, and the presentation of mathematics should be just as free from emphasis on routine as from forbidding dogmatism which refuses to disclose motive or goal and which is an unfair obstacle to honest effort. (From the preface to the first edition of What is Mathematics? by Richard Courant and Herbert Robbins, 1941.

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. --

At almost all academic institutions worldwide, complex variables and analytic functions are utilized in courses on applied mathematics, physics, engineering, and other related subjects. For most students, formulas alone do not provide a sufficient introduction to this widely taught material, yet illustrations of functions are sparse in current books on the topic. This is the first primary introductory textbook on complex variables and analytic functions to make extensive use of functional illustrations. Aiming to reach undergraduate students entering the world of complex variables and analytic functions, this book utilizes graphics to visually build on familiar cases and illustrate how these same functions extend beyond the real axis. It covers several important topics that are omitted in nearly all recent texts, including techniques for analytic continuation and discussions of elliptic functions and of Wiener–Hopf methods. It also presents current advances in research, highlighting the subject’s active and fascinating frontier. The primary audience for this textbook is undergraduate students taking an introductory course on complex variables and analytic functions. It is also geared toward graduate students taking a second semester course on these topics, engineers and physicists who use complex variables in their work, and students and researchers at any level who want a reference book on the subject.

Intended as a companion for textbooks in mathematical methods for science and engineering, this book presents a large number of numerical topics and exercises together with discussions of methods for solving such problems using

Mathematica(R). Although it is primarily designed for use with the author's "Mathematical Methods: For Students of Physics and Related Fields," the discussions in the book sufficiently self-contained that the book can be used as a supplement to any of the standard textbooks in mathematical methods for undergraduate students of physical sciences or engineering.

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 class of multivalent functions is an important one in complex analysis. They occur for example in the proof of De Branges' Theorem, which in 1985 settled the long-standing Bieberbach conjecture. The second edition of Professor Hayman's celebrated book contains a full and self-contained proof of this result, with a new chapter devoted to it. Another new chapter deals with coefficient differences. The text has been updated in several other ways, with recent theorems of Baernstein and Pommerenke on univalent functions of restricted growth, and an account of the theory of mean p-valent functions. In addition, many of the original proofs have been simplified. Each chapter contains examples and exercises of varying degrees of difficulty designed both to test understanding and illustrate the material.

Written by two authors who have been teaching Mathematica courses to scientists and engineers for years, this book is a must for anyone who needs to use Mathematica to solve complex problems in the applied sciences. The book tackles complex, practical problems, and shows how to solve them from start to finish.

From the algebraic properties of a complete number field, to the analytic properties imposed by the Cauchy integral formula, to the geometric qualities originating from conformality, Complex Variables: A Physical Approach with Applications and MATLAB explores all facets of this subject, with particular emphasis on using theory in practice. The first five chapters encompass the core material of the book. These chapters cover fundamental concepts, holomorphic and harmonic functions, Cauchy theory and its applications, and isolated singularities. Subsequent chapters discuss the argument principle, geometric theory, and conformal mapping, followed by a more advanced discussion of harmonic functions. The author also presents a detailed glimpse of how complex variables are used in the real world, with chapters

on Fourier and Laplace transforms as well as partial differential equations and boundary value problems. The final chapter explores computer tools, including Mathematica®, MapleTM, and MATLAB®, that can be employed to study complex variables. Each chapter contains physical applications drawing from the areas of physics and engineering. Offering new directions for further learning, this text provides modern students with a powerful toolkit for future work in the mathematical sciences.

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

The unique feature of this compact student's introduction is that it presents concepts in an order that closely follows a standard mathematics curriculum, rather than structure the book along features of the software. As a result, the book provides a brief introduction to those aspects of the Mathematica software program most useful to students. The second edition of this well loved book is completely rewritten for Mathematica 6 including coverage of the new dynamic interface elements, several hundred exercises and a new chapter on programming. This book can be used in a variety of courses, from precalculus to linear algebra. Used as a supplementary text it will aid in bridging the gap between the mathematics in the course and Mathematica. In addition to its course use, this book will serve as an excellent tutorial for those wishing to learn Mathematica and brush up on their mathematics at the same time.

This book is about harmonic functions in Euclidean space. This new edition contains a completely rewritten chapter on spherical harmonics, a new section on extensions of Bochers Theorem, new exercises and proofs, as well as revisions throughout to improve the text. A unique software package supplements the text for readers who wish to explore harmonic function theory on a computer.

The unique feature of this compact student's introduction to Mathematica® and the Wolfram LanguageTM is that the order of the material closely follows a standard mathematics curriculum. As a result, it provides a brief introduction to those aspects of the Mathematica® software program most useful to students. Used as a supplementary text, it will help bridge the gap between Mathematica® and the mathematics in the course, and will serve as an excellent tutorial for former students. There have been significant changes to Mathematica® since the second edition, and all chapters have now been updated to account for new features in the software, including natural language queries and the vast stores of real-world data that are now integrated through the cloud. This third edition also includes many new exercises and a chapter on 3D printing that showcases the new computational geometry capabilities that will equip readers to print in 3D.
Complex Analysis with MATHEMATICA®Cambridge University Press
Integral representations of holomorphic functions play an important part in the classical theory of functions of one complex variable and in multidimensional com plex analysis (in the later case, alongside with integration over the whole boundary aD of a domain D we frequently encounter integration over the Shilov boundary 5 = S(D)). They solve the classical problem of recovering at the points of a do main D a holomorphic function that is sufficiently well-behaved when approaching the boundary aD, from its values on aD or on S. Alongside with this classical problem, it is possible and natural to consider the following one: to recover the holomorphic function in D from its values on some set MeaD not containing S. Of course, M is to be a set of uniqueness for the class of holomorphic functions under consideration (for example, for the functions continuous in D or belonging to the Hardy class HP(D), p ~ 1).
Introduction to Chemical Engineering Analysis Using Mathematica, Second Edition reviews the processes and designs used to manufacture, use, and dispose of chemical products using Mathematica, one of the most powerful mathematical software tools available for symbolic, numerical, and graphical computing. Analysis and computation are explained simultaneously. The book covers the core concepts of chemical engineering, ranging from the conservation of mass and energy to chemical kinetics. The text also shows how to use the latest version of Mathematica, from the basics of writing a few lines of code through developing entire analysis programs. This second edition has been fully revised and updated, and includes analyses of the conservation of energy, whereas the first edition focused on the conservation of mass and ordinary differential equations. Offers a fully revised and updated new edition, extended with conservation of energy Covers a large number of topics in chemical engineering analysis, particularly for applications to reaction systems Includes many detailed examples Contains updated and new worked problems at the end of the book Written by a prominent scientist in the field
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.