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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.

Fourier Analysis

An Introduction *Princeton University Press*

This first volume, a three-part introduction to the subject, is intended for students with a beginning knowledge of mathematical analysis who are motivated to discover the ideas that shape Fourier analysis. It begins with the simple conviction that Fourier arrived at in the early nineteenth century when studying problems in the physical sciences--that an arbitrary function can be written as an infinite sum of the most basic trigonometric functions. The first part implements this idea in terms of notions of convergence and summability of Fourier series, while highlighting applications such as the isoperimetric

inequality and equidistribution. The second part deals with the Fourier transform and its applications to classical partial differential equations and the Radon transform; a clear introduction to the subject serves to avoid technical difficulties. The book closes with Fourier theory for finite abelian groups, which is applied to prime numbers in arithmetic progression. In organizing their exposition, the authors have carefully balanced an emphasis on key conceptual insights against the need to provide the technical underpinnings of rigorous analysis. Students of mathematics, physics, engineering and other sciences will find the theory and applications covered in this volume to be of real interest. 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 Fourier Analysis is the first, 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.

Problems and Solutions for Complex Analysis *Springer Science & Business Media*

All the exercises plus their solutions for Serge Lang's fourth edition of "Complex Analysis," ISBN 0-387-98592-1. The problems in the first 8 chapters are suitable for an introductory course at undergraduate level and cover power series, Cauchy's theorem, Laurent series, singularities and meromorphic functions, the calculus of residues, conformal mappings, and harmonic functions. The material in the remaining 8 chapters is more advanced, with problems on Schwartz reflection, analytic continuation, Jensen's formula, the Phragmen-Lindelöf theorem, entire functions, Weierstrass products and meromorphic functions, the Gamma function and Zeta function. Also beneficial for anyone interested in learning complex analysis.

Real Analysis

Measure Theory, Integration, and Hilbert Spaces *Princeton University Press*

Real Analysis is the third volume in the Princeton Lectures in Analysis, a series of four textbooks that aim to present, in an integrated manner, the core areas of analysis. Here the focus is on the development of measure and integration theory, differentiation and integration, Hilbert spaces, and Hausdorff measure and fractals. This book reflects the objective of the series as a whole: to make plain the organic unity that exists between the various parts of the subject, and to illustrate the wide applicability of ideas of analysis to other fields of mathematics and science. After setting forth the basic facts of measure theory, Lebesgue integration, and differentiation on Euclidian spaces, the authors move to the elements of Hilbert space, via the L^2 theory. They next present basic illustrations of these concepts from Fourier analysis, partial differential equations, and complex analysis. The final part of the book introduces the reader to the fascinating subject of fractional-dimensional sets, including Hausdorff measure, self-replicating sets, space-filling curves, and Besicovitch sets. Each chapter has a series of exercises, from the relatively easy to the more complex, that are tied directly to the text. A substantial number of hints encourage the reader to take on even the more challenging exercises. As with the other volumes in the series,

Real Analysis is accessible to students interested in such diverse disciplines as mathematics, physics, engineering, and finance, at both the undergraduate and graduate levels. Also available, the first two volumes in the Princeton Lectures in Analysis:

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 Analysis *Cambridge University Press*

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

Complex Analysis *Springer Science & Business Media*

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.

An Introduction to Complex Analysis and Geometry *American Mathematical Soc.*

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.

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.

Problems and Solutions for Undergraduate Analysis *Springer Science & Business Media*

The present volume contains all the exercises and their solutions for Lang's second edition of Undergraduate Analysis. The wide variety of exercises, which range from computational to more conceptual and which are of varying difficulty, cover the following subjects and more: real numbers, limits, continuous functions, differentiation and elementary integration, normed vector spaces, compactness, series, integration in one variable, improper integrals, convolutions, Fourier series and the Fourier integral, functions in n -space, derivatives in vector spaces, the inverse and implicit mapping theorem, ordinary differential equations, multiple integrals, and differential forms. My objective is to offer those learning and teaching analysis at the undergraduate level a large number of completed exercises and I hope that this book, which contains over 600 exercises covering the topics mentioned above, will achieve my goal. The exercises are an integral part of Lang's book and I encourage the reader to work through all of them. In some cases, the problems in the beginning chapters are used in later ones, for example, in Chapter IV when one constructs bump functions, which are used to smooth out singularities, and prove that the space of functions is dense in the space of regulated maps. The numbering of the problems is as follows. Exercise IX. 5. 7 indicates Exercise 7, §5, of Chapter IX. Acknowledgments I am grateful to Serge Lang for his help and enthusiasm in this project, as well as for teaching me mathematics (and much more) with so much generosity and patience.

A Course in Complex Analysis *Princeton University Press*

"This textbook is intended for a year-long graduate course on complex analysis, a branch of mathematical analysis that has broad applications, particularly in physics, engineering, and applied mathematics. Based on nearly twenty years of classroom lectures, the book is accessible enough for independent study, while the rigorous approach will appeal to more experienced readers and scholars, propelling further research in this field. While other graduate-level complex analysis textbooks do exist, Zakeri takes a distinctive approach by highlighting the geometric properties and topological underpinnings of this area. Zakeri includes more than three hundred and fifty problems, with problem sets at the end of each chapter, along with additional solved examples. Background knowledge of undergraduate

analysis and topology is needed, but the thoughtful examples are accessible to beginning graduate students and advanced undergraduates. At the same time, the book has sufficient depth for advanced readers to enhance their own research. The textbook is well-written, clearly illustrated, and peppered with historical information, making it approachable without sacrificing rigor. It is poised to be a valuable textbook for graduate students, filling a needed gap by way of its level and unique approach"--

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 Painlevé'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.

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.

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.

An Introduction to Complex Analysis *Springer Science & Business Media*

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.

Functional Analysis *New Age International*

The Book Is Intended To Serve As A Textbook For An Introductory Course In Functional Analysis For The Senior Undergraduate And Graduate Students. It Can Also Be Useful For The Senior Students Of Applied Mathematics, Statistics, Operations Research, Engineering And Theoretical Physics. The Text Starts With A Chapter On Preliminaries Discussing Basic Concepts And Results Which Would Be Taken For Granted Later In The Book. This Is Followed By Chapters On Normed And Banach Spaces, Bounded Linear Operators, Bounded Linear Functionals. The Concept And Specific Geometry Of Hilbert Spaces, Functionals And Operators On Hilbert Spaces And Introduction To Spectral Theory. An Appendix Has Been Given On Schauder Bases. The Salient Features Of The Book Are: * Presentation Of The Subject In A Natural Way * Description Of The Concepts With Justification * Clear And Precise Exposition Avoiding Pseudantry * Various Examples And Counter Examples * Graded Problems Throughout Each Chapter Notes And Remarks Within The Text Enhances The Utility Of The Book For The Students.

Problems and Solutions for Complex Analysis *Springer Science & Business Media*

All the exercises plus their solutions for Serge Lang's fourth edition of "Complex Analysis," ISBN 0-387-98592-1. The problems in the first 8 chapters are suitable for an introductory course at undergraduate level and cover power series, Cauchy's theorem, Laurent series, singularities and meromorphic functions, the calculus of residues, conformal mappings, and harmonic functions. The material in the remaining 8 chapters is more advanced, with problems on Schwartz reflection, analytic continuation, Jensen's formula, the Phragmen-Lindelöf theorem, entire functions, Weierstrass products and meromorphic functions, the Gamma function and Zeta function. Also beneficial for anyone interested in learning 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.

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.

Classical Topics in Complex Function Theory *Springer Science & Business Media*

An ideal text for an advanced course in the theory of complex functions, this book leads readers to experience function theory personally and to participate in the work of the creative mathematician. The author includes numerous glimpses of the function theory of several complex variables, which illustrate how autonomous this discipline has become. In addition to standard topics, readers will find Eisenstein's proof of Euler's product formula for the sine function; Wielandt's uniqueness theorem for the gamma function; Stirling's formula; Issacs theorem; Bessel's proof that all domains in $\mathbb{C}$ are domains of holomorphy; Wedderburn's lemma and the ideal theory of rings of holomorphic functions; Estermann's proofs of the overconvergence theorem and Bloch's theorem; a holomorphic imbedding of the unit disc in $\mathbb{C}^3$; and Gauss's expert opinion on Riemann's dissertation. Remmert elegantly presents the material in short clear sections, with compact proofs and historical comments interwoven throughout the text. The abundance of examples, exercises, and historical remarks, as well as the extensive bibliography, combine to make an invaluable source for students and teachers alike.

A Course in Complex Analysis and Riemann Surfaces

American Mathematical Society

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.

Nine Introductions in Complex Analysis - Revised Edition

Elsevier

The book addresses many topics not usually in "second course in complex analysis" texts. It also contains multiple proofs of several central results, and it has a minor historical perspective. - Proof of Bieberbach conjecture (after DeBranges) - Material on asymptotic values - Material on Natural Boundaries - First four chapters are comprehensive introduction to entire and meromorphic functions - First chapter (Riemann Mapping Theorem) takes up where "first courses" usually leave off

The Elements of Integration and Lebesgue Measure

John Wiley & Sons

Consists of two separate but closely related parts. Originally published in 1966, the first section deals with elements of integration and has been updated and corrected. The latter half details the main concepts of Lebesgue measure and uses the abstract measure space approach of the Lebesgue integral because it strikes directly at the most important results—the convergence theorems.

Quantum Field Theory and Condensed Matter

An Introduction Cambridge University Press

Providing a broad review of many techniques and their application to condensed matter systems, this book begins with a review of thermodynamics and statistical mechanics, before moving onto real and imaginary time path integrals and the link between Euclidean quantum mechanics and statistical mechanics. A detailed study of the Ising, gauge-Ising and XY models is included. The renormalization group is developed and applied to critical phenomena, Fermi liquid theory and the

renormalization of field theories. Next, the book explores bosonization and its applications to one-dimensional fermionic systems and the correlation functions of homogeneous and random-bond Ising models. It concludes with Bohm-Pines and Chern-Simons theories applied to the quantum Hall effect. Introducing the reader to a variety of techniques, it opens up vast areas of condensed matter theory for both graduate students and researchers in theoretical, statistical and condensed matter physics.

Complex Made Simple

American Mathematical Soc.

Perhaps uniquely among mathematical topics, complex analysis presents the student with the opportunity to learn a thoroughly developed subject that is rich in both theory and applications. Even in an introductory course, the theorems and techniques can have elegant formulations. But for any of these profound results, the student is often left asking: What does it really mean? Where does it come from? In *Complex Made Simple*, David Ullrich shows the student how to think like an analyst. In many cases, results are discovered or derived, with an explanation of how the students might have found the theorem on their own. Ullrich explains why a proof works. He will also, sometimes, explain why a tempting idea does not work. *Complex Made Simple* looks at the Dirichlet problem for harmonic functions twice: once using the Poisson integral for the unit disk and again in an informal section on Brownian motion, where the reader can understand intuitively how the Dirichlet problem works for general domains. Ullrich also takes considerable care to discuss the modular group, modular function, and covering maps, which become important ingredients in his modern treatment of the often-overlooked original proof of the Big Picard Theorem. This book is suitable for a first-year course in complex analysis. The exposition is aimed directly at the students, with plenty of details included. The prerequisite is a good course in advanced calculus or undergraduate analysis.

Visual Complex Functions

An Introduction with Phase Portraits

Springer Science & Business Media

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.

Introduction to Complex Analysis

OUP Oxford

Complex analysis is a classic and central area of mathematics,

which is studied and exploited in a range of important fields, from number theory to engineering. *Introduction to Complex Analysis* was first published in 1985, and for this much awaited second edition the text has been considerably expanded, while retaining the style of the original. More detailed presentation is given of elementary topics, to reflect the knowledge base of current students. Exercise sets have been substantially revised and enlarged, with carefully graded exercises at the end of each chapter. This is the latest addition to the growing list of Oxford undergraduate textbooks in mathematics, which includes: Biggs: *Discrete Mathematics* 2nd Edition, Cameron: *Introduction to Algebra*, Needham: *Visual Complex Analysis*, Kaye and Wilson: *Linear Algebra*, Acheson: *Elementary Fluid Dynamics*, Jordan and Smith: *Nonlinear Ordinary Differential Equations*, Smith: *Numerical Solution of Partial Differential Equations*, Wilson: *Graphs, Colourings and the Four-Colour Theorem*, Bishop: *Neural Networks for Pattern Recognition*, Gelman and Nolan: *Teaching Statistics*.

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.

Calculus Reordered

A History of the Big Ideas *Princeton University Press*

How our understanding of calculus has evolved over more than three centuries, how this has shaped the way it is taught in the classroom, and why calculus pedagogy needs to change *Calculus Reordered* takes readers on a remarkable journey through hundreds of years to tell the story of how calculus evolved into the subject we know today. David Bressoud explains why calculus is credited to seventeenth-century figures Isaac Newton and Gottfried Leibniz, and how its current structure is based on developments that arose in the nineteenth century. Bressoud argues that a pedagogy informed by the historical development of calculus represents a sounder way for students to learn this fascinating area of mathematics. Delving into calculus's birth in the Hellenistic Eastern Mediterranean—particularly in Syracuse, Sicily and Alexandria, Egypt—as well as India and the Islamic Middle East, Bressoud considers how calculus developed in response to essential questions emerging from engineering and astronomy. He looks at how Newton and Leibniz built their work on a flurry of activity that occurred throughout Europe, and how Italian philosophers such as Galileo Galilei played a particularly

important role. In describing calculus's evolution, Bressoud reveals problems with the standard ordering of its curriculum: limits, differentiation, integration, and series. He contends that the historical order—integration as accumulation, then differentiation as ratios of change, series as sequences of partial sums, and finally limits as they arise from the algebra of inequalities—makes more sense in the classroom environment. Exploring the motivations behind calculus's discovery, *Calculus Reordered* highlights how this essential tool of mathematics came to be.

Complex Analysis *Springer Nature*

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.

Introduction to Complex Analysis *American Mathematical Soc.*

It really is a gem, both in terms of its table of contents and the level of discussion. The exercises also look very good. --Clifford Earle, Cornell University This book has a soul and has passion. --William Abikoff, University of Connecticut This classic book gives an excellent presentation of topics usually treated in a complex analysis course, starting with basic notions (rational functions, linear transformations, analytic function), and culminating in the discussion of conformal mappings, including the Riemann mapping theorem and the Picard theorem. The two quotes above confirm that the book can be successfully used as a text for a class or for self-study.

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

This book is intended as a textbook for a first course in the theory of functions of one complex variable for students who are mathematically mature enough to understand and execute E - I) arguments. The actual pre requisites for reading this book are quite minimal; not much more than a stiff course in basic calculus and a few facts about partial derivatives. The topics from advanced calculus that are used (e.g., Leibniz's rule for differentiating under the integral sign) are proved in detail. *Complex Variables* is a subject which has something for all mathematicians. In addition to having applications to other parts of analysis, it can rightly claim to be an ancestor of many areas of

mathematics (e.g., homotopy theory, manifolds). This view of Complex Analysis as "An Introduction to Mathematics" has influenced the writing and selection of subject matter for this book. The other guiding principle followed is that all definitions, theorems, etc.

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.

Fourier Analysis

An Introduction *Princeton University Press*

This first volume, a three-part introduction to the subject, is intended for students with a beginning knowledge of mathematical analysis who are motivated to discover the ideas that shape Fourier analysis. It begins with the simple conviction that Fourier arrived at in the early nineteenth century when studying problems in the physical sciences--that an arbitrary function can be written as an infinite sum of the most basic trigonometric functions. The first part implements this idea in terms of notions of convergence and summability of Fourier series, while highlighting applications such as the isoperimetric inequality and equidistribution. The second part deals with the Fourier transform and its applications to classical partial differential equations and the Radon transform; a clear introduction to the subject serves to avoid technical difficulties. The book closes with Fourier theory for finite abelian groups, which is applied to prime numbers in arithmetic progression. In organizing their exposition, the authors have carefully balanced an emphasis on key conceptual insights against the need to provide the technical underpinnings of rigorous analysis. Students of mathematics, physics, engineering and other sciences will find the theory and applications covered in this volume to be of real interest. 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 Fourier Analysis is the first, 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 Analyses in Engineering, Science and Technology *Bentham Science Publishers*

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

The Calculus of Happiness

How a Mathematical Approach to Life Adds Up to Health, Wealth, and Love *Princeton University Press*

How math holds the keys to improving one's health, wealth, and love life What's the best diet for overall health and weight management? How can we change our finances to retire earlier? How can we maximize our chances of finding our soul mate? In *The Calculus of Happiness*, Oscar Fernandez shows us that math yields powerful insights into health, wealth, and love. Relying on only high school-level math (precalculus with a dash of calculus), Fernandez uses everyday experiences to provide context for his mathematical insights and guides us through surprising results. Important formulas are linked to a dozen free online interactive calculators on the book's website, allowing one to personalize equations. Every chapter ends with a summary of essential lessons and takeaways, and for advanced math fans, Fernandez includes the mathematical derivations in the appendices.

Linear and Complex Analysis

Dedicated to V.P. Havin on the Occasion of His 75th Birthday *American Mathematical Soc.*

Fourier Integrals in Classical Analysis *Cambridge University Press*

This advanced monograph is concerned with modern treatments of central problems in harmonic analysis. The main theme of the book is the interplay between ideas used to study the propagation of singularities for the wave equation and their counterparts in classical analysis. In particular, the author uses microlocal analysis to study problems involving maximal functions and Riesz means using the so-called half-wave operator. To keep the treatment self-contained, the author begins with a rapid review of Fourier analysis and also develops the necessary tools from microlocal analysis. This second edition includes two new chapters. The first presents Hörmander's propagation of singularities theorem and uses this to prove the Duistermaat-Guillemin theorem. The second concerns newer results related to the Kakeya conjecture, including the maximal Kakeya estimates obtained by Bourgain and Wolff.

Calculus Simplified *Princeton University Press*

An accessible, streamlined, and user-friendly approach to calculus Calculus is a beautiful subject that most of us learn from professors, textbooks, or supplementary texts. Each of these resources has strengths but also weaknesses. In *Calculus*

Simplified, Oscar Fernandez combines the strengths and omits the weaknesses, resulting in a “Goldilocks approach” to learning calculus: just the right level of detail, the right depth of insights, and the flexibility to customize your calculus adventure. Fernandez begins by offering an intuitive introduction to the three key ideas in calculus—limits, derivatives, and integrals. The mathematical details of each of these pillars of calculus are then covered in subsequent chapters, which are organized into mini-lessons on topics found in a college-level calculus course. Each mini-lesson focuses first on developing the intuition behind calculus and then on conceptual and computational mastery. Nearly 200 solved examples and more than 300 exercises allow for ample opportunities to practice calculus. And additional resources—including video tutorials and interactive graphs—are available on the book’s website. Calculus Simplified also gives you the option of personalizing your calculus journey. For example, you can learn all of calculus with zero knowledge of exponential, logarithmic, and trigonometric functions—these are discussed at the end of each mini-lesson. You can also opt for a more in-depth understanding of topics—chapter appendices provide additional insights and detail. Finally, an additional appendix explores more in-depth real-world applications of calculus. Learning calculus should be an exciting voyage, not a

daunting task. Calculus Simplified gives you the freedom to choose your calculus experience, and the right support to help you conquer the subject with confidence. · An accessible, intuitive introduction to first-semester calculus · Nearly 200 solved problems and more than 300 exercises (all with answers) · No prior knowledge of exponential, logarithmic, or trigonometric functions required · Additional online resources—video tutorials and supplementary exercises—provided

Complex Analysis with Applications to Number Theory *Springer Nature*

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 addition 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.