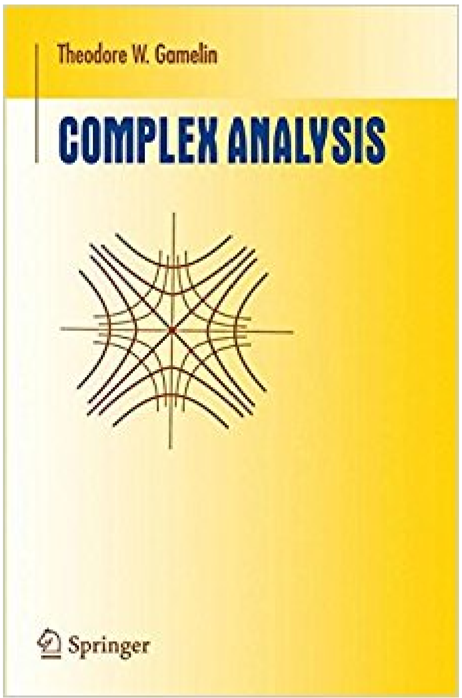
Complex Analysis (Undergraduate Texts In Mathematics)



Synopsis

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.

Book Information

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Customer Reviews

"More than 800 well-chosen exercises with 20 pages of hints and solutions, together with clear and concise expositions of many results, makes this book enjoyable even for specialists in the field. The book is recommended for libraries, students, and teachers of both undergraduate and graduate courses.""Newsletter of the EMS, Issue 42, December 2001"From the reviews: "More than 800 well-chosen exercises with 20 pages of hints and solutions, together with clear and concise expositions of many results, makes this book enjoyable even for specialists in the field. The book is recommended for libraries, students, and teachers of both undergraduate and graduate courses."Newsletter of the EMS, Issue 42, December 2001 "This is a wonderful book about the fundamentals of complex analysis. It touches all essential parts of complex function theory, and very often goes deeper into the subject than most elementary texts. ??? I find the pace, style and didactics in the presentation perfect. ??? All in all, this is one of the best if not the best book on the elementary theory of complex functions, and it can serve as a textbook as well as a reference book." (V. Totik, Mathematical Reviews, Issue 2002 h) "This is a well organized textbook on complex analysis ??? . Each part of the book contains some interesting exercises which give many new insights into further developments and enhance the usefulness of the book. At the end of the book there are hints and solutions for selected exercises." (F. Haslinger, Internationale Mathematische Nachrichten, Vol. 56 (191), 2002) "As the book begins with the rudiments of the subject and goes upto an advanced level, it will be equally useful to the undergraduates and to students at the pre Ph. D. level. The numerous applications to Physics found in the book redound to its value in the hands of students of Mathematics, Physics and Engineering alike." (K. S. Padmanabhan, Journal of the Indian Academy of Mathematics, Vol.24 (1), 2002) "This is a beautiful book which provides a very good introduction to complex analysis for students with some familiarity with complex numbers. ??? The book is clearly written, with rigorous proofs, in a pleasant and accessible style. It is warmly recommended to students and all researchers in complex analysis." (Gabriela Kohr, The Mathematical Gazette, Vol. 86 (506), 2002) "The author of this fine textbook is a prominent function theorist. He leads the reader in a careful but far-sighted way from the elements of complex analysis to advanced topics in function theory and at some points to topics of modern research. ??? We found, however, that a special feature of the book is the wealth of exercises at the end of each section ??? . Altogether, the author has given us a wonderful textbook for use in classroom and in seminars." (Dieter Gaier, Zentralblatt MATH, Vol. 978, 2002) "The author wishes to provide beginners with standard material in a rather flexible course. ??? The preface contains useful hints for both instructors and students. More than 800 well-chosen exercises with 20 pages of hints and solutions, together with clear and concise expositions of many results, make this book enjoyable even for specialists in the field. The book is recommended for libraries, students, and teachers of both undergraduate and graduate courses." (Acta Scientiarum Mathematicarum, Vol. 68, 2002) "This book has the somewhat unusual aim of providing a primer in complex analysis at three different levels - a basic undergraduate introduction, a course for those who have decided to specialise as part of their firstdegree and a more demanding treatment of postgraduate topics. ??? I can certainly recommend this book to all those who wish to experience (in the author??’s own words) the ???fascinating and wonderful world??? of complex analysis, ???filled with broad avenues and narrow backstreets leading to intellectual excitement.???" (Gerry Leversha, European Mathematical Society Newsletter, Issue 42, December 2001)From the reviews: "More than 800 well-chosen exercises with 20 pages of hints and solutions, together with clear and concise expositions of many results, makes this book enjoyable even for specialists in the field. The book is recommended for libraries, students, and teachers of both undergraduate and graduate courses."Newsletter of the EMS, Issue 42, December 2001 "This is a wonderful book about the fundamentals of complex analysis. 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I liked this book because I believe computation is critical to a deep understanding of a mathematical subject. Here we have examples and problems (with solutions) that will test your ability to use the theory. I agree with others that there is some hand waving when it comes to rigor. If you have no experience with the subject you might like the "popular math" book An Imaginary Tale by Paul Nahin to get your feet wet. I wouldn’t start with Ahlfors. Another book that is loved by many but panned for lack of rigor by some is Visual Complex Analysis by Needham. I also like some of the older books like Watson’s A Course in Modern Analysis and some of the inexpensive books published by Dover. There’s a lot to choose from but this one is among the best for people who like practical math.

Taking this book at face value, it does not disappoint. It cuts through a lot of the fluff that is found in almost every complex analysis book. However, if you are looking for a text that builds your understanding from the ground up (the primary complaint leveled against this book), then I would recommend Ã¢Â ÂœComplex Variables with ApplicationsÃ¢Â Â• by Wunsch. In fact, there is a plethora of books on the subject with each author giving their own account of this remarkable field in mathematics. So I guess you could take it or leave it.If you are coming into this course with a semester of real analysis under your belt, then chapters I-VII are pretty straightforward and discuss familiar concepts that cover the basics of complex analysis with a look at power series, Laurent series and isolated singularities, and the Residue theorem. I found a lot of the material overlapped with topics from a numerical methods course (i.e. Cauchy estimates, Hermite polynomials etc.) with applications in physics and engineering. The sections on complex notation and PompeiuÃ¢Â Â™s formula introduce the Cauchy-Riemann equations, a topic that will be revisited in your standard DE class, which goes to show that readers can approach this subject from various fields of study. In fact, you will encounter topics from PDE in the sections on harmonic functions, the Poisson integral formula and Schwarz reflection principle. There is no doubt a lot of ground covered here, which also includes a discussion on the Riemann mapping theorem with a two-page proof presented at the end of the chapter.If it is not yet apparent to the reader, you will encounter about 2/3 of the material sometime during your undergraduate career in mathematics. In fact, there is a section on hyperbolic geometry that is of particular importance to students of pure mathematics. The proof of Schwarz lemma is used to determine the conformal self-maps of the unit disk, which transitions into PickÃ¢Â Â™s lemma and the hyperbolic geometry of the unit disk.Part 3 of this book explores methods in complex analysis with a discussion on the Julia and Mandelbrot set, Dirichlet series, the prime number theorem and the Riemann surfaces, which illustrate the wide scope of this field in particular. Note: These last five chapters also serve to complete the coverage of all background necessary for passing graduate-level exams in complex analysis (or so the author claims). However, it is really up to the interest and, more importantly, the pace of the reader as to what they would like to take away from this text.

Never before have I began reading a book more predisposed to hate it. Generally, I like to read math books that are slim because I feel that it forces the author to get right to the heart of the material as quickly as possible. I also like my math books to have a rigid structure of formal proofs surrounded by expositional paragraphs. This book, on the other hand, sits at an intimidating 478 pages and has no proofs that are set aside in the proof environment in LaTeX. The proofs are blended together with the general commentary paragraphs in the flow of this book's exposition. So it was a huge surprise for me when I actually found that I enjoyed reading this book.The first thing that I think should be noted is that this book is written in an informal language. I know many reviewers have stated that this bothers them and have hinted at the fact that they think some of the proofs here are less-than-rigorous (perhaps implying wrong). I don't think this is the case at all and there's a good reason for this. This book is about conveying the essence of a proof to the reader much more than the gritty technical details (which there is little of in basic complex analysis in the first place). This is a good thing. Whatever can be said about the books by Rudin or some others, you cannot possibly say that a newcomer to the subject would walk away with a good intuition for the subject on a first go. Here is a book entirely devoted to teaching the reader how to think about the material so that they will see the results as being natural, and the book does a marvelous job at it. Now, with this in mind, I thought that all of the proofs were very rigorously stated, and the fact that he used English instead of mathematical symbols for everything greatly enhanced the readability of the proofs. The only proof that was less-than-rigorous in my eyes was the proof of Green's Theorem, but Gamelin comes right out and states that it won't be rigorous, and I don't think you can bash a complex analysis book for not proving a multivariable result. Another thing worth noting is that this book takes a more geometric approach to the material in that it focuses on how FLTs behave and how regions are deformed/not deformed by certain types of mappings. This is the style that seems most popular for introductory texts and was seemingly popularized by Ahlfors's text.Another thing that I think should be mentioned is that by the time a student can reasonably begin looking for books on complex analysis, they should have the ability and mathematical maturity to take a description or an explanation and digest it and turn it into formal mathematics need be. When you converse with your friends or colleagues about math, you don't speak in epsilons and deltas, but rather in general terms which cut to the heart of the argument. Gamelin is doing this, but in a much more structured format than what you would expect, and so I think this style is beneficial. For example, when I came to the proof of the Reside Theorem, I instantly knew what he was going to do for the proof before I read it. I had an intuition for the material that made the results appear natural, and for a first book to do this is quite impressive.So what about the problems. As staying in the first book on the subject category, this is a book which has a wide variety of problems and difficulty levels. If you attempt most of them (which you should with this book) then I think you would walk away with a very good understanding of how to use the results in both simple and complicated scenarios. However, you must do most of the harder problems. It would be very easy to simply do the easy problems and then be lured into a false sense of security about your depth of understanding.Another thing that needs to be mentioned is that a first book in complex analysis should teach computational techniques as well as theoretical ones. Complex analysis was made, in part, to compute definite and indefinite integrals. So having a book that does not teach you how to use the residue theorem to compute an integral is doing you a disservice. This is another reason why books like Rudin's Real and Complex Analysis are not good first choices for textbooks. Here is a book that teaches the student how to do computations when they are needed, and gives plenty of clear examples and practice problems so that the student can become proficient.The breadth of information that this book covers is also impressive. This book covers all of the standard material (with a pinch of not-so-standard material) in the first eleven chapters (out of sixteen). I took a graduate course at UMich which covered this material exactly and it was a very solid course. After this material, any student could go on to further topics in other books and would be completely comfortable recognizing and implementing complex analytic techniques in more advanced analysis books. I have not read the last five chapters (which cover special functions, approximation theorems, Riemann surfaces, and solutions to the Dirichlet problem), but they appear to carry the same style as the rest of the book, which in my mind means they should be good as well.All in all, I think this book is as good of a book as any other for a first exposure to the material. Obviously more advanced books will be needed by graduate students later in their studies, but I would not look past this book as a first course (especially when Ahlfors is almost two-hundred dollars now).

I posted the following review with the Bak/Newman book, but I thought reproducing it here as well may be useful:I have invested a lot of effort searching for the "ideal" textbook on complex variables. I found Bak/Newman to be extremely terse, with minimal detail, inadequate explanations, and unenlightening examples. The book by Brown/Churchill is a very accessible introduction, although I was surprised by the number of typos, and the use of "multivalued functions" may cause confusion. I came to the conclusion that the book by Gamelin may be the best overall in terms of clarity of explanation, rigor, and useful detail.

Complex Analysis (Undergraduate Texts in Mathematics) Mathematics and Technology (Springer Undergraduate Texts in Mathematics and Technology) The Mathematics of Nonlinear Programming (Undergraduate Texts in Mathematics) The Art of Proof: Basic Training for Deeper Mathematics (Undergraduate Texts in Mathematics) Linear Algebra: An Introduction to Abstract Mathematics (Undergraduate Texts in Mathematics) Discrete Mathematics: Elementary and Beyond (Undergraduate Texts in Mathematics) Proofs and Fundamentals: A First Course in Abstract Mathematics (Undergraduate Texts in Mathematics) Mathematics and Its History (Undergraduate Texts in Mathematics) Reading, Writing, and Proving: A Closer Look at Mathematics (Undergraduate Texts in Mathematics) The Mathematics of Medical Imaging: A Beginnerâ ™s Guide (Springer Undergraduate Texts in Mathematics and Technology) Real Mathematical Analysis (Undergraduate Texts in Mathematics) Understanding Analysis (Undergraduate Texts in Mathematics) Elementary Analysis: The Theory of Calculus (Undergraduate Texts in Mathematics) Numerical Analysis: Mathematics of Scientific Computing (The Sally Series; Pure and Applied Undergraduate Texts, Vol. 2) Complex Analysis For Mathematics And Engineering (International Series in Mathematics) An Introduction to Mathematical Finance with Applications: Understanding and Building Financial Intuition (Springer Undergraduate Texts in Mathematics and Technology) Combinatorics and Graph Theory (Springer Undergraduate Texts in Mathematics and Technology) Combinatorics and Graph Theory (Undergraduate Texts in Mathematics) Linear Optimization: The Simplex Workbook (Undergraduate Texts in Mathematics) Mathematical Introduction to Linear Programming and Game Theory (Undergraduate Texts in Mathematics)