Preface

Approach This text is intended for undergraduate students in mathematics, physics, and engineering. We have attempted to strike a balance between the pure and applied aspects of complex analysis and to present concepts in a clear writing style that is understandable to students at the junior or senior undergraduate level. A wealth of exercises that vary in both difficulty and substance gives the text flexibility. Sufficient applications are included to illustrate how complex analysis is used in science and engineering. The use of computer graphics gives insight for understanding that complex analysis is a computational tool of practical value. The exercise sets offer a wide variety of choices for computational skills, theoretical understanding, and applications that have been class tested for two editions of the text. Student research projects are suggested throughout the text and citations are made to the bibliography of books and journal articles.

The purpose of the first six chapters is to lay the foundations for the study of complex analysis and develop the topics of analytic and harmonic functions, the elementary functions, and contour integration. If the goal is to study series and the residue calculus and applications, then Chapters 7 and 8 can be covered. If conformal mapping and applications of harmonic functions are desired, then Chapters 9 and 10 can be studied after Chapter 6. A new Chapter 11 on Fourier and Laplace transforms has been added for courses that emphasize more applications.

Proofs are kept at an elementary level and are presented in a self-contained manner that is understandable for students having a sophomore calculus background. For example, Green's theorem is included and it is used to prove the Cauchy-Goursat theorem. The proof by Goursat is included. The development of series is aimed at practical applications.

Features Conformal mapping is presented in a visual and geometric manner so that compositions and images of curves and regions can be understood. Boundary value problems for harmonic functions are first solved in the upper half-plane so that conformal mapping by elementary functions can be used to find solutions in other domains. The Schwarz-Christoffel formula is carefully developed and applications are given. Two-dimensional mathematical models are used for applications in the area of ideal fluid flow, steady state temperatures and electrostatics. Computer drawn figures accurately portray streamlines, isothermals, and equipotential curves.

New for this third edition is a historical introduction of the origin of complex numbers in Chapter 1. An early introduction to sequences and series appears in Chapter 4 and facilitates the definition of the exponential function via series. A new section on the Julia and Mandelbrot sets shows how complex analysis is connected to contemporary topics in mathematics. Many sections have been revised including branches of functions, the elementary functions, and Taylor and Laurent series. New material includes a section on the Joukowski airfoil and an additional chapter on Fourier series and Laplace transforms. Modern computer-generated illustrations have been introduced in the third edition including: Riemann surfaces, contour and surface graphics for harmonic functions, the Dirichlet problem, streamlines involving harmonic and analytic functions, and conformal mapping.

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computers, involving the abovementioned software products. Instructors who use the text may contact the authors directly for information regarding the availability of the F(Z)™, MATLAB®, Maple™, and Mathematica™ supplements. The authors appreciate suggestions and comments for improvements and changes to the text. Correspondence can be made directly to the authors via surface or e-mail.

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