Preface

This book is the culmination of teaching complex analysis to many groups of students at York University for many years. It is intended for a one-semester course for advanced undergraduate students and also first-year graduate students in mathematics. In a nutshell, it is a straightforward and coherent account of a body of knowledge in complex analysis from complex numbers to Cauchy's integral theorems and formulas to more advanced topics such as automorphism groups, the Schwarz problem in partial differential equations and boundary behavior of harmonic functions. While a few rudimentary facts in modern algebra are used in Chapters 21 and 22, a basic undergraduate course in real analysis is the only prerequisite for a complete understanding of the book.

It is clear from the table of contents that the topics are standard and can be found in different existing textbooks and monographs. The subject matter on complex analysis, especially on one-variable complex analysis, is so mature that in almost any textbook of this kind, the novelty has to be sought in the choice of topics, the genesis of the presentation and the lucidity of the exposition. The predilection for topics in this book is dictated by personal experiences and the inevitably personal view on the relevance to the forefront of research in analysis and partial differential equations. Nothwithstanding the importance of the geometric and topological nature of complex analysis to many experts, the emphasis of this book is decisively on analysis. While this is a book on mathematics with no explicit mention of applications to other sciences or engineering, it is evident that the bulk of the book consisting of Chapters 1–18 contains the bread and butter for students in pure and applied mathematics using complex analysis as a mathematical tool or learning the subject for its own sake.

To render the book accessible and elementary and to make sure that a one-semester course can convey enough topics of sufficient depth to the students, some care has to be taken in the treatment of Cauchy's integral theorem. In this book Cauchy's integral theorem is stated precisely in sufficient generality, but a proof of it is only given for a rectangle in a simply connected domain. Exercises for each chapter are included. Some of them contain ramifications of the results presented in detail in the text. The amount is minimal and the temptation of including a lot of drill exercises is avoided. Students should do all of them.

The first eighteen chapters constitute a good first course in complex analysis for undergraduate students in mathematics, physical sciences and engineering. A course tailored for more advanced undergraduate students and first-year graduate students may be based on Chapters 5–23. An ideal course is to study the book in detail from cover to cover in one semester.

It is hardly necessary to give an extensive list of references on complex analysis at the level of this book. Excellent books on the subject abound and can be found easily in any university library. Collected in the bibliography are books and papers on complex analysis that have been useful for the writing of this book. Useful references on real analysis and modern algebra used in this book are provided. Also included in the bibliography are references that are extensions of the more advanced topics in the last three chapters of the book. The value of demonstrating to the students the relevance of such a well-established and classic subject as complex analysis to mainstream mathematics and some research topics of current interest is enormous.

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