Preface to the Second Edition

As is usual in a second edition, various minor flaws that had crept into the first edition have been corrected. Certain topics are now presented more clearly, it is hoped, after being rewritten and/or reorganized. The treatment has been expanded only slightly: there is now a section on division of power series, and a brief discussion of homotopy. (The latter topic was relegated to a couple of exercises in the first edition.) Four appendices have been added; they contain needed background which, experience has shown, is not possessed nowadays by all students taking introductory complex analysis.

In this edition, the numbers of certain exercises are preceded by an asterisk. The asterisk indicates that the exercise will be referred to later in the text. In many cases the result established in the exercise will be needed as part of a proof.

I am indebted to a number of students for detecting minor errors in the first edition, and to Robert Burckel and Bjorn Poonen for their valuable comments. Special thanks go to George Bergman and his eagle eye. George, while teaching from the first edition, read it carefully and provided a long list of suggested improvements, both in exposition and in typography. I owe my colleague Henry Helson, the publisher of the first edition, thanks for encouraging me to publish these *Notes* in the first place, and for his many kindnesses during our forty-plus years together at Berkeley.

The figures from the first edition have been redrawn by Andrew D. Hwang, whose generous help is greatly appreciated. I am indebted to Edward Dunne and his AMS colleagues for the patient and professional way they shepherded my manuscript into print.

Finally, as always, I am deeply grateful to my wife, Mary Jennings, for her constant support, in particular, for applying her TEXnical skills to this volume.

Berkeley, California
January 26, 2007

Preface to the First Edition[1]

These are the notes for a one-semester introductory course in the theory of functions of a complex variable. The aim of the notes is to help students of mathematics and related sciences acquire a basic understanding of the subject, as a preparation for pursuing it at a higher level or for employing it in other areas. The approach is standard and somewhat old-fashioned.

The user of the notes is assumed to have a thorough grounding in basic real analysis, as one can obtain, for example, from the book of W. Rudin cited in the list of references. Notions like metric, open set, closed set, interior, boundary, limit point, and uniform convergence are employed without explanation. Especially important are the notions of a connected set and of the connected components of a set. Basic notions from abstract algebra also occur now and then. These are all concepts that ordinarily are familiar to students by the time they reach complex function theory.

As these notes are a rather bare-bones introduction to a vast subject, the student or instructor who uses them may well wish to supplement them with other references. The notes owe a great deal to the book by L. V. Ahlfors and to the book by S. Saks and A. Zygmund, which, together with the teaching of George Piranian, were largely responsible for my own love affair with the subject. Several other excellent books are mentioned in the list of references.

[1] The first edition was published by Henry Helson under the title *Notes on Complex Function Theory*.

The notes contain only a handful of pictures, not enough to do justice to the strong geometric component of complex function theory. The user is advised to make his or her own sketches as an aid to visualization. Thanks go to Andrew Hwang for drawing the pictures.

The approach in these notes to Cauchy's theorem, the central theorem of the subject, follows the one used by Ahlfors, attributed by him to A. F. Beardon. An alternative approach based on Runge's approximation theorem, adapted from Saks and Zygmund, is also presented.

The terminology used in the notes is for the most part standard. Two exceptions need mention. Some authors use the term "region" specifically to refer to an open connected subset of the plane. Here the term is used, from time to time, in a less formal way. On the other hand, the term "contour" is used in the notes in a specific way not employed by other authors.

I wish to thank my Berkeley Math H185 class in the Spring Semester, 1994, for pointing out a number of corrections to the prepublication version of the notes, and my wife, Mary Jennings, who read the first draft of the notes and helped me to anticipate some of the questions students might raise as they work through this material. She also typed the manuscript. I deeply appreciate her assistance and support. The notes are dedicated to her.

Berkeley, California
June 8, 1994