

Preface

Approximate solutions to many problems that cannot be solved analytically, arise from numerical and other approximation techniques. In this book, the numerical methods and algorithms are developed for approximating such solutions. It also includes some methods of computation that yield exact results.

This book is appropriate as a text for a course in computational methods as well as a reference for researchers who need such methods in their work. The book contains a presentation of some well-known approximation methods that are scattered throughout existing literature as well as techniques that are obscure such as Chio's method for evaluating a determinant in ch. 5 and Namias' extension of the Stirling approximation to the gamma function for large argument in Appendix 3. Material that seems to be original is also presented; such as evaluating integrals using Parseval's theorem for periodic functions, beta and gamma functions, and Heaviside operator methods, along with solving integral equations with singular kernels and numerical evaluation of Cauchy principle value integrals.

To provide the reader with concrete applications of these methods, the book relies heavily on illustrative examples. I have provided a table of examples (like a table of contents) with descriptive titles to give the reader quick access to these illustrations.

This manuscript was prepared using Microsoft Word and MathType. MathType is an equation editor developed and marketed by Design Science Co. of Long Beach, California. Because of constraints encountered using these programs, it is sometimes necessary to position a mathematical expression in a sentence that does not fit on the same line as the text in that sentence. Such expressions have been placed on a separate line, centered on the page. They should be read as if they were text within the sentence. These expressions are distinguished from equations in that they are in the center of the page, they do not contain an "equal" ($=$), "not equal" (\neq), or "inequality" ($>$, \leq , etc.) symbol and are not designated with an equation number. Equations are displayed starting close to or at the left margin, have one or more equal, not equal or inequality symbols, and are identified by an equation number. An example of this "out of line" part of a sentence can be found at the bottom of page 133.

My thanks are expressed to those students in the Mathematical Methods of Physics courses that I taught over the years at California State University, Los Angeles. Their curiosity and questions helped in the development of this material. My motivation to write this book came from a group of physics, chemistry, and mathematics students who sat in on a course that I taught at Shandong University in Jinan, Peoples Republic of China. I thank them all for that motivation. I am particularly grateful to Mr. Li Yuan (Paul) for his help in that course.

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