Preface

The objective of this book is to provide a comprehensive discussion of Fourier and Chebyshev spectral methods for the computation of incompressible viscous flows, based on the Navier-Stokes equations.

For reasons of efficiency and confidence in the numerical results, the researchers and practitioners involved in computational fluid dynamics must be able to master the numerical methods they use. Therefore, in writing this book, beyond the description of the algorithms, I have also tried to provide information on the mathematical and computational, as well as implementational characteristics of the methods.

The book contains three parts. The first is intended to present the fundamentals of the Fourier and Chebyshev methods for the solution of differential problems. The second part is entirely devoted to the solution of the Navier-Stokes equations, considered in vorticity-streamfunction and velocity-pressure formulations. The third part is concerned with the solution of stiff and singular problems, and with the domain decomposition method.

In writing this book, I owe a great debt to the joint contribution of several people to whom I wish to express my deep gratitude. First, I express my friendly thanks to L. Sirovich, editor of the series “Applied Mathematical Sciences,” who suggested that I write the book. Many thanks are also addressed to my colleagues and former students who contributed to the completion of the book in various ways. I am happy to thank P. Bontoux, O. Botella, J.A. Désidéri, U. Ehrenstein, M.Y. Forestier, J. Fröhlich, S. Gauthier, H. Guillard, P. Le Quéré, J.-M. Malé, C. Olivier, R. Pasquetti, J.-P. Pulicani, I. Raspo, C. Sabbah, E. Serre, B. Shizgal, and H. Vivian.
Lastly, I wish to acknowledge the courtesy of the International Center of Mechanical Sciences in Udine (Italy) for allowing me to use, in Chapter 4, a part of the material published in the Lectures Notes *Advanced Turbulent Flow Computations*.

Nice, France, May 2001

Roger Peyret
Spectral Methods for Incompressible Viscous Flow
Peyret, R.
2002, XII, 434 p., Hardcover