31[65-06, 76-06, 78-06, 35L05, 65C20]—*Mathematical and numerical aspects of wave propagation*, Gary Cohen (Editor), SIAM, Philadelphia, PA, and INRIA, Rocquencourt, France, 1995, xiv+808 pp., $25\frac{1}{2}$ cm, softcover, $106.00

These are the proceedings of the third international conference on the topic of the book title. The conference was held in April 1995 in French Riviera and featured 8 invited lectures and 88 contributed papers. The book contains short articles or abstracts of 7 invited lectures and 86 contributed papers.

The invited lectures are mostly reviews on different aspects of wave propagation, including multiple scattering, numerical methods for electromagnetic equations, large-time asymptotics for certain wave equations, homogenization and Wigner transforms (only an abstract), inverse problems via layer stripping, approximation via distributed approximating functionals, and applications to marine science. These papers may serve as a good introduction and reference source for people interested in the recent development of wave propagation. Not all the major areas in wave propagation, though, are covered in the invited lectures. For example, wavelets, an important tool in approximations for wave phenomena, are missing.

The contributed papers consist of all oral presentations in Part II and poster presentations in Part III. Part II is also divided into 12 sections, covering water waves, boundary integral equations, numerical methods, electromagnetism, homogenization and asymptotic analysis, absorbing boundary conditions, scattering, guided waves, parallel processing, domain decomposition methods, optimal control and inverse problems, and nonlinear waves. The division of papers into these categories is not sharp though. Many papers may actually fit in different sections. The quality of these contributed papers varies; however, most are good papers containing relevant and recent research results in wave propagation. Some are excellent papers containing important results. About half of the contributed papers are from France.

This book is of interest to researchers in the broad area of wave propagation.

C.-W.S.

32[34-01, 34-04]—*Differential equations with Mathematica*, by Kevin R. Coombes, Brian R. Hunt, Ronald L. Lipsman, John E. Osborn, and Garrett J. Stuck, Wiley, New York, 1995, vi+218 pp., $23\frac{1}{2}$ cm, softcover, $20.95

The authors' preface and introduction give clear and accurate statements of their goals and the content of the book, some of which are quoted here.

"We designed this supplement to accompany" [1] ".... It could, however, easily be used in conjunction with most other ODE texts." True, but it would be easy to get a different impression because the text is so closely connected to [1]: there is a syllabus for use with [1], many problems are taken directly from [1], and there are a good many references to [1] in the review material. Because the content of a first course in ODEs is so standard, I believe the supplement could be used with any of the popular texts, certainly with [2], the text I have been using.

"This supplement changes the emphasis in the traditional ODE course by using a mathematical software system to introduce numerical methods, geometric interpretation, symbolic computation, and qualitative analysis into the course in a basic

way." This book is based on Mathematica; there is a forthcoming version based on Maple. These are both general-purpose computing environments. Other authors have relied upon specialized software for computer experiments in ODE courses. Reviews of some of the possibilities can be found in [3]. There are advantages to both approaches: General-purpose software is harder to learn and more trouble to apply in a particular context like ODEs. On the other hand, it provides capabilities not available in most packages specialized to ODEs and is a valuable tool for general computation. Some schools amortize the effort required to learn general-purpose software by using the software in a variety of courses.

Having chosen to work with Mathematica, the authors explain in Chapter 2 the interface on four popular platforms. They introduce the package in Chapter 3 and amplify its use in Chapter 8. The philosophy is to develop the necessary understanding of the package gradually and by means of examples. There are a Glossary of Mathematica commands and a chapter of Sample Notebook Solutions. The authors exploit the "Notebooks" in Mathematica that allow a student to include computations and graphics when writing up an experiment. "Engineers and scientists have to develop not only skills in analyzing problems and interpreting solutions, but also the ability to present coherent conclusions in a logical and convincing style." As an absolute beginner working entirely on my own, I found the authors' development of Mathematica to be quite satisfactory.

The authors' approach is to review a mathematical topic in a chapter and follow it with a substantial set of problems on the topic. The review is brief, clear, and illustrated with examples. There are six sets of problems. Along with the general instruction on using Mathematica, the reader has the examples and a sample solution to assist in solving the problems. I found the problems to be interesting illustrations of topics taken up in a standard first course on ODEs.

One of the virtues of a general-purpose package like Mathematica is that it is possible to solve ODEs symbolically as well as numerically. Besides direct solution by symbolic means, it is also possible to use Laplace transforms and series expansions. The authors take up all these techniques, but they emphasize the more generally applicable numerical solution. They supplement the usual ODE course by providing a rather nice chapter on numerical methods.

I have read this book carefully, checked all the examples of the text and the sample notebooks (including, thanks to Wolfram Research, the results stated for several versions of Mathematica), and worked problems from each of the sets. I encountered very few errors, none of which was serious.

References

1. W. E. Boyce and R. C. DiPrima, *Elementary differential equations*, 5th ed., Wiley, New York, 1992.
2. C. H. Edwards, Jr. and D. E. Penney, *Elementary differential equations with applications*, Prentice-Hall, Englewood Cliffs, NJ, 1985.
3. Consortium for Ordinary Differential Equations Experiments home page, http://www.math.hmc.edu/codee

Lawrence F. Shampine
Department of Mathematics
Southern Methodist University
Dallas, TX 75275