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**5[65D20, 33-04]**—*Computation of special functions*, by Shanjie Zhang and Jianming Jin, John Wiley & Sons, Inc., New York, NY, 1996, xxvi+717 pp., $24\frac{1}{2}$ cm, hardcover, $89.95

This book provides Fortran software on an included diskette for computing numerical values of important special functions. The scope of coverage is a subset of the functions found in Abramowitz and Stegun [1]. Among the omissions are Coulomb wave and Weierstrass elliptic functions, but this hardly alters the fact that the authors undertook a giant task in coding original programs and writing documentation for them in this book. The programs are all encoded in double precision, and the text implies (without making any explicit statement) that results are good to single precision.

What is the audience for this book? Numerical analysts? Unlikely, since there is almost no mathematical development of the mostly standard methods that are used or quantitative derivation of bounds or estimates for rounding and truncation errors. Library developers? Probably not, because a lot of additional work would be required to bring the programs up to current standards of software engineering with respect to accuracy, portability and error handling. Educators? Possibly. As an auxiliary resource in a technical course of study, or for a person interested in self-study, the book gives a realistic flavor of how functions are computed. Engineers and scientists? Maybe. The authors are professors of engineering, and the book does provide an inexpensive source of tolerable software for many functions, some of which are not easy to find elsewhere. However, those who use special functions regularly in computation will be aware of libraries such as IMSL, NAG and SLATEC, engineering packages such as Mathcad, symbolic systems such as Macsyma, Maple and Mathematica, and software repositories such as Netlib, all of which provide considerable support for special functions. Also, the recent books [2, 3, 4], similar in content and style to the book under review here, can be consulted.

Consider a typical chapter, say the one on $J_\nu(z)$ and $Y_\nu(z)$ (other Bessel functions are treated in separate chapters). The chapter has 9 sections. The first gives a collection of basic formulae accompanied by sketchy commentary and a few simple figures. The next four sections are devoted to computation of $J_\nu(z), Y_\nu(z)$ in the cases

(1) $z$ real and $\nu \in \{0,1\}$,
(2) $z$ real and $\nu$ a positive integer,
(3) $z$ complex and $\nu$ a positive integer,
(4) $z$ complex and $\nu$ real and positive.

This arrangement, which reflects algorithmic conveniences, is consistent with other software packages and libraries. Each of these sections discusses a computational approach and relates it to a program listed in full in the text. Mathematical details are kept to a minimum in these discussions, though the authors do not neglect the basic requirements of successful numerical computation of special functions, such as choosing crossover points wisely and running recurrence processes in the stable direction. A feature that may tilt the orientation of the book toward educators is the development of alternative methods and programs in each of cases (1) through (4). Section 6 assesses accuracy and validity using consistency and comparison checks. The software of Section 7 computes zeros of the functions by Newton's method. The use of asymptotic expansions, illustrated in [1, p. 387], would avoid unnecessary loss of precision through cancellation but is not considered. Section 8 shows how to apply the previous software to compute lambda functions, and the final section gives 15 pages of numerical values in tables computed by the authors' software.

## References

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**6[86-08, 86A05]**—*Computational ocean acoustics*, by Finn B. Jensen, William A. Kuperman, Michael B. Porter and Henrik Schmidt, AIP Series in Modern Acoustics and Signal Processing, American Institute of Physics, New York, NY, 1994, xvi+612 pp., 24 cm, $85.00

I have enjoyed reading this book. Indeed once I picked it up, I found it hard to put down until I had gone through it. This book has a truly panoramic view of the subject, beginning with elementary ideas, and then proceeding to the most advanced aspects of the material. It is thorough in its treatment of the various topics. The first chapter *Fundamentals of Ocean Acoustics* is a very nice introduction of the material from a historical perspective, and also presents a large number of facts in a very economical manner. Chapter 2 *Wave Propagation Theory* gives a derivation of the acoustic differential equation and has an introduction to acoustic propagation in a waveguide, including the ideal fluid wave guide and the Perkeris waveguide. Chapter 3, on *Ray Methods*, obtains the Eikonal equations from the Helmholtz equation and solves the transport equations. A discussion of caustics, ray tracing, and WKB theory are included in this chapter. Chapter 4, on *Wavenumber Integration Techniques*, contains what one would expect, namely a reduction of the Helmholtz equation, with source term, through Hankel transformation to an ordinary differential equation. The Hankel transformed equation is then solved under various situations, i.e. homogeneous fluid layers, $n^2$-linear layers, etc. Homogeneous elastic layers are also treated by means of displacement potentials. As is