REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

The numbers in brackets are assigned according to the American Mathematical Society classification scheme. The 1980 Mathematics Subject Classification (1985 Revision) can be found in the December index volumes of Mathematical Reviews.

38[65-01].—HEINZ RUTISHAUSER, *Lectures on Numerical Mathematics* (translated from the German by Walter Gautschi), Birkhäuser, Boston, 1990, xv+ 546 pp., $23\frac{1}{2}$ cm. Price $49.50.

H. Rutishauser was a successful pioneer in numerical analysis at the beginning of the computer age. The German edition of his lecture notes was prepared posthumously for publication in two volumes by M. Gutknecht at the suggestion of, and with advice from, P. Henrici, P. Läuchli, and H.-R. Schwarz. The engineers and other scientists who attended Rutishauser's classes learned how the calculus and the elements of linear algebra could be skillfully used for a wide variety of applications. Algorithms and short sections of ALGOL codes were developed and analyzed for problems in optimization, linear algebra, approximation, numerical integration, ordinary differential equations, partial differential equations, etc. To confirm Rutishauser's fine taste in choice of topics, it suffices to observe that he gives a treatment of Floquet's theory for a linear ordinary differential equation with periodic coefficients. Throughout he is concerned with developing robust, stable algorithms and computer programs. The text has many illustrative examples that expose the underlying principles of numerical analysis and computer science.

This translation into fluent English with its editorial corrections makes the material more widely available. However, the inclusion of new supplementary notes and bibliographical references at the end of each of the thirteen chapters brings every section up to date! Hence, the book is now a most useful reference for the student, teacher, engineer, and scientist. W. Gautschi achieved this remarkable resurrection with the acknowledged help of C. de Boor, H. Brunner, B. N. Parlett, F. A. Potra, J. K. Reid, H. J. Stetter, and L. B. Wahlbin. A number of people had suggested that Gautschi update the work and he also gives credit for this to G. W. Stewart's review of the German edition in *Bull. Amer. Math. Soc.*, vol. 84, no. 4, July, 1978, pp. 660–663.

The book concludes with a self-contained 65-page appendix "An axiomatic theory of numerical computation with an application to the quotient-difference

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algorithm." This material is divided into five chapters and is a not quite completed monograph that Rutishauser had been preparing until his untimely death.

E. I.

39[65–01].—LARS ELDÉN & LINDE WITTMEYER-KOCH, *Numerical Analysis: An Introduction*, Academic Press, Boston, 1990, x+347 pp., $23\frac{1}{2}$ cm. Price $39.95.

This book is intended for an introductory course in numerical analysis at the advanced undergraduate level. The student or reader is thus supposed to have prior knowledge in calculus and preferably in linear algebra. The book consists of ten chapters with the headings:

Chapter 1: Introduction.
Chapter 2: Error analysis and computer arithmetic.
Chapter 3: Function evaluation.
Chapter 4: Nonlinear equations.
Chapter 5: Interpolation.
Chapter 6: Differentiation and Richardson extrapolation.
Chapter 7: Numerical integration.
Chapter 8: Systems of linear equations.
Chapter 9: Approximation.
Chapter 10: Differential equations.

The short Chapter 1 is devoted to a discussion of the relationships between mathematical models and corresponding numerical problems.

In Chapter 2 we find a discussion of various sources of errors and derivation of the well-known formulas for error propagation. This topic is dealt with in most textbooks in numerical analysis. But the authors also give an interesting discussion of the IEEE standard for floating-point arithmetic and about pipelined floating-point operations.

Next, Chapter 3 deals with fairly modern topics, such as the CORDIC algorithm for evaluating trigonometric functions. We find here also some useful classical results such as the estimation of the remainder of a truncated alternating series by means of Leibniz's theorem and the integral estimate for truncated positive series.

Chapters 4 and 5 give a useful treatment of classical topics which have many applications.

Chapter 6 presents the important Richardson extrapolation, which should be known by almost everyone working in the area of numerical calculations. Its application to numerical differentiation is treated here, but in subsequent chapters this extrapolation is applied to numerical integration and the treatment of differential equations.

In Chapter 7 we find the classical Romberg scheme for numerical integration. Perhaps the authors could have mentioned in this context that there are situations (e.g., in the integration of periodic functions, or when the interval