REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

The numbers in brackets are assigned according to the indexing system printed in Volume 22, Number 101, January 1968, page 212.

63[1, 7].—HERBERT BUCHHOLZ, *The Confluent Hypergeometric Function, with Special Emphasis on its Applications*, translated by H. Lichtblau & K. Wetzel, Springer-Verlag, New York, 1969, xviii + 238 pp., 24 cm. Price $16.00.

This translation of the original 1953 edition published in German is a valuable book on the subject. For some reason, the original was not reviewed in these annals, and so we present a more detailed review. One must bear in mind that a great deal of research has been done in this area since 1953. In this connection, one should consult references [1]–[6] and other pertinent references given in these sources.

As is perhaps well known, there are several notations in use for confluent hypergeometric functions. The principal functions investigated are those of Whittaker, $M_{k,m}(z)$ and $W_{k,m}(z)$, though the author frequently prefers

$$\mathcal{M}_{k,m/2}(z) = [\Gamma(m+1)]^{-1} M_{k,m/2}(z).$$

These functions are often called parabolic functions, which should not be confused with parabolic cylinder functions, as the latter are special cases of the Whittaker functions.

In Chapter I, the Kummer series ${}_1F_1$ is introduced as a limiting form of Gauss' ${}_2F_1$ series. The differential equation satisfied by the ${}_1F_1$ is transformed into Whittaker's form and various properties of its solutions are developed. These include Wronskians, derivatives, and contiguous relations (the translation comes out as "circuital relations"). Related differential equations and separation of the wave equation in coordinates of the parabolic cylinder and of the paraboloid of revolution are also studied.

Integral representations of Whittaker functions and their products are treated in Chapter II while indefinite and definite integrals (e.g., Laplace and Mellin transforms) of these functions are studied in Chapter IV.

Chapter III takes up asymptotic expansions of the Whittaker functions when one of the three quantities z, k or m is large, the others being fixed, or when k and m are both large but $k - m$ is fixed.

A number of polynomials including those of Laguerre and Hermite are special cases of $\mathcal{M}_{k,m/2}(z)$ and are studied in Chapter V. Numerous series and integrals involving these polynomials are listed.

Chapter VII is devoted to integral representations and expansions in series of Whittaker functions for various types of waves in mathematical physics.

Zeroes of $\mathcal{M}_{k,m}(z)$ as a function of z and of k are considered in Chapter VIII. Eigenvalue problems involving parabolic functions are also studied.

Appendix I summarizes special cases of the parabolic functions. These include Bessel functions, the incomplete gamma functions and related functions, parabolic cylinder functions, Coulomb wave functions and the polynomials already noted.

Appendix II is an impressive list of references. A notation and symbol index at the beginning of the book and a subject index at the end of the book are of considerable help to the user. The intervening 17 years have not diminished the stature of this important treatise.

Y. L. L.

1. A. ERDÉLYI ET AL., *Higher Transcendental Functions*, Vols. 1 and 2, McGraw-Hill, New York, 1953. (See *MTAC*, v. 11, 1957, pp. 114–116.)
2. F. G. TRICOMI, *Funzioni Ipergeometriche Confluenti*, Edizioni Cremonese, Rome, 1954.
3. L. J. SLATER, *Confluent Hypergeometric Functions*, Cambridge Univ. Press, New York, 1960. (See *Math. Comp.*, v. 15, 1961, pp. 98–99.)
4. L. J. SLATER, *Generalized Hypergeometric Functions*, Cambridge Univ. Press, New York, 1966. (See *Math. Comp.*, v. 20, 1966, pp. 629–630.)
5. A. W. BABISTER, *Transcendental Functions Satisfying Nonhomogeneous Linear Differential Equations*, Macmillan, New York, 1967. (See *Math. Comp.*, v. 22, 1968, pp. 223–226.)
6. Y. L. LUKE, *The Special Functions and Their Approximations*, Vols. 1 and 2, Academic Press, New York, 1969.

64[2, 3, 4, 5, 13].—ROBERT L. KETTER & SHERWOOD P. PRAWEL, JR., *Modern Methods of Engineering Computation*, McGraw-Hill Book Co., New York, 1969, xiv + 492 pp., 23 cm. Price $15.50.

The book is intended to provide an introductory numerical analysis text for second- or third-year students of engineering and applied science. Some familiarity with computer programming is assumed.

After two introductory chapters on engineering problems and digital computers, the authors devote five chapters on matrix computation. Among the topics included are determinants, matrices, linear algebraic systems, matrix inversion, and the eigenvalue problem. Surprisingly, there is no mention of pivotal strategies in connection with Gauss elimination. Nonlinear equations are treated next, and topics related to interpolation, numerical differentiation and integration, least squares approximation, are collected in a chapter entitled "Miscellaneous Methods." There follow two chapters on the numerical solution of ordinary and partial differential equations, and a final chapter on optimization.

The discussion is verbose and discursive, throughout, and there are numerous instances of lax terminology and factual inaccuracies. The reviewer does not believe, therefore, that the book adequately fills the needs of the students for which it is intended.

W. G.

65[2, 4, 12].—W. A. WATSON, T. PHILIPSON & P. J. OATES, *Numerical Analysis—The Mathematics of Computing*, American Elsevier Publishing Co., New York, 1969, v. 1, xi + 224 pp.; v. 2, x + 166 pp., 23 cm. Price $4.50 and $5.50, respectively (paperbound).

This attractive textbook in two volumes was written specifically as an introduction to numerical analysis in the sixth form of British secondary schools and for more