and the derivative operators xD and Dx are studied in Chapter VI.

Each chapter contains numerous examples and problems for the reader. Undoubtedly, these should be useful for self-study and to locate specific examples needed in a wide variety of problems.

Y. L. L.

65[4, 7, 8, 11, 13].—MURRAY R. SPIEGEL, *Mathematical Handbook of Formulas and Tables*, McGraw-Hill Book Co., New York, 1968, x + 271 pp., 28 cm. Price $3.95 (paperbound).

This relatively inexpensive compilation of mathematical formulas and tables is a recent addition to the popular Schaum's Outline Series of books mainly in mathematics and engineering.

The book is divided into two main parts. Part I (Formulas) consists of 41 sections, of which 39 present a total of 2309 formulas (supplemented by diagrams and graphs) selected from a wide range of topics in such fields as algebra, geometry, trigonometry, analytic geometry, calculus, differential equations, vector analysis, Fourier series, Fourier and Laplace transforms, special functions (gamma, beta, Bessel, Legendre, elliptic, and others), and probability distributions. The first and last sections of Part I consist, respectively, of a table of 27 frequently used mathematical constants (given to from 10S to 25S) and a useful table of conversion factors.

Part II (Tables) consists of 52 numerical tables, preceded by a set of sample problems illustrating their use. These tables, which generally range in precision from 3S to 7S, cover the standard elementary functions as well as a large number of the higher mathematical functions, including the gamma function, Bessel functions, exponential integral, sine and cosine integrals, Legendre polynomials, elliptic integrals, and the error function. Also included are tables for the calculation of compound interest and annuities, and a small table of random numbers. An appended index of special symbols and notations and a general index have also been included.

Despite the existence of several errors (listed elsewhere in this issue), this reviewer considers this attractively arranged and clearly printed book to be a valuable addition to the ever-increasing number of such handbooks.

J. W. W.

66[3, 8].—PETER LANCASTER, *Theory of Matrices*, Academic Press, New York, 1969, xii + 316 pp., 24 cm. Price $11.00.

This book differs considerably in the material presented from most books on matrices and linear algebra and deserves wide adoption, especially in courses intended for students majoring in other areas who are interested primarily in applications. Nevertheless, only a few sections are devoted to applications as such, and then only in terms of their mathematical formulation with no discussion of the physics itself. Thus there are sections on small vibrations, differential equations, and Markoff chains.

After a rather standard introduction in the first two chapters, the third discusses the Courant-Fischer and related theorems; the Smith canonical form and the Frobenius and Jordan normal forms are developed in the next chapter; the fifth chapter is devoted to functions of matrices, and the sixth to norms; then comes a chapter on perturbation theory, one on direct products and stability, and, finally, a chapter on nonnegative matrices.

The treatment is lucid, and the only prerequisites are elementary algebra and calculus. Only the real and complex fields are considered. There are a reasonable number of examples and exercises, and about three or four references per chapter for supplementary reading. The book provides an excellent background in the subject for prospective numerical analysts, as well as to the many nonmathematicians who need to use matrices in their work.

A. S. H.

67[7].—Irwin Roman, *Extrema of Derivatives of* $J_0(x)$, ms. of nine typewritten sheets (dated Jan. 1964), deposited in the UMT file.

This manuscript table gives to 10S the critical points below 100 and the corresponding extrema of the first four derivatives of the Bessel function $J_0(x)$. Accuracy to within two units in the final figure is claimed. Also tabulated are the (rational) values of these derivatives for zero argument.

A six-page introduction sets forth a detailed description of the method used in computing the tabular values on a desk calculator. In particular, formulas are listed relating the derivatives of $J_0(x)$ to linear combinations of $J_0(x)$ and $J_1(x)$, with coefficients expressed as polynomials in $1/x$. The values of these Bessel functions required in the computation of the table were obtained by interpolation in the Harvard tables [1].

A concluding page lists the six basic references cited in the introductory text.

As implied by the author, this unique table constitutes a natural supplement to published tables of extrema of $J_0(x)$, in particular, that compiled by the Mathematical Tables Committee of the British Association for the Advancement of Science [2].

J. W. W.

1. Harvard University, Computation Laboratory, *Annals*, v. 3: *Tables of the Bessel Functions of the First Kind of Orders Zero and One*, Harvard University Press, Cambridge, Mass., 1947. (See *MTAC*, v. 2, 1947, pp. 261–262, RMT **380**.)

2. British Association for the Advancement of Science, *Mathematical Tables*, v. 6: *Bessel Functions, Part I, Functions of Orders Zero and Unity*, Cambridge University Press, Cambridge, England, 1937. (See *MTAC*, v. 1, 1945, pp. 361–363, RMT **179**.)

68[7].—T. S. Murty & J. D. Taylor, *Zeros and Bend Points of the Legendre Function of the First Kind for Fractional Orders*, Oceanographic Research, Marine Sciences Branch, Department of Energy, Mines and Resources, Ottawa, Canada. Deposited in UMT file.

Let

$$P_\nu(x) = {}_2F_1\left(-\nu, 1 + \nu; \frac{1}{2}; \frac{1 - x}{2}\right)$$

$$P_\nu(x_j) = 0\,, \qquad P_\nu'(y_j) = 0\,.$$

The following are tabulated: