particularly useful to analysts of all kinds who need an unconventional inequality at a critical juncture in a proof, to high school and college teachers who want interesting problems for their classes, and to students who wish to practice their analytic skills.

RICHARD BELLMAN

95[X].—JOHN R. RICE, *The Approximation of Functions*, Vol. 1: *Linear Theory*, Addison-Wesley Publishing Company, Inc., Reading, Mass., 1964, x + 203 pp., 24 cm. Price $8.75.

Most of the volume is concerned with the problem of best approximation of a given real function f by a linear combination of given real functions $\phi_1, \phi_2, \cdots, \phi_n$ over a closed interval or over a finite (real) point set. Special cases emphasized are the classical ones of best approximation by polynomials and by trigonometric polynomials, but the more general setting is stressed to a much larger degree than that common in other texts.

The first chapter (entitled Fundamentals) is an introduction to the subject, in which the author seeks to give the reader a feeling for approximation theory and its methods. Also some theorems relating to the foundation of the theory are proved in this chapter.

The second chapter is a brief introduction to the subject of orthogonal systems of functions. The author succeeds in clearly showing the advantages of least-squares approximation from the points of view of ease of computation and simplicity and elegance of theory.

The third chapter deals quite extensively with the theory of best Tchebycheff approximation.

Chapter 4 discusses the problem of best approximation in the L_1 norm.

Chapter 5 (The Weierstrass Theorem and Degree of Convergence) deals mainly with classical results of Weierstrass, Fejér and Jackson, namely, those theorems which (together with Tchebycheff's work) form the classical backbone of approximation theory in the real domain.

The sixth chapter (Computational Methods) gives a survey of methods for the actual construction of best (or merely good) approximations. Two of the methods discussed are the method of descent and linear programming.

The book is rich in problems (of which some serve as exercises and others as an integral part of the text) and in illustrations. It is suitable both as a reference and as a classroom text.

As to the material presented, the book combines classical results with recent ones, including contributions of the author to approximation theory.

It is a highly valuable work that should attract many to study the theory of approximation and to contribute to it.

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96[X].—JAMES SINGER, *Elements of Numerical Analysis*, Academic Press, Inc., New York, 1964, x + 395 pp., 24 cm. Price $8.75.

This introductory textbook in numerical analysis presupposes mathematical preparation equivalent to the completion of a first course in the calculus, supplemented by some knowledge of advanced calculus and differential equations.

An unusual feature, which the author recognizes in the Preface, is the inclusion of a chapter on graphical and nomographic methods.

The book begins with a good introduction to approximate numbers and computational errors, followed by a well-motivated chapter on computation with power series and asymptotic series. Typical of the manipulation of power series therein is the derivation of recursion formulas for the Bernoulli numbers and for the logarithmic numbers (which are later identified with the coefficients in Gregory's integration formula).

Also included in this book are conventional treatments of interpolation (divided differences; the Aitken-Neville procedure; formulas of Lagrange, Newton, Gauss, Stirling, Bessel, and Everett), the numerical solution of algebraic and transcendental equations (regula falsi, the method of chords, iterative methods such as that of Newton-Raphson), numerical differentiation and integration in terms of differences and of ordinates (formulas of Gregory, Newton-Cotes, and Gauss), the numerical solution of ordinary differential equations (methods of Picard, Runge-Kutta, Adams, and Milne; use of power series), and curve fitting (method of averages, least squares).

In the opinion of the reviewer, the discussion of the solution of simultaneous linear equations is regrettably superficial. The procedure recommended by the author is Gauss elimination, although he does not identify it as such. The problem of the evaluation of errors in the solution arising from errors in the coefficients of the system of equations (which is considered in detail by several authors, such as Milne and Hildebrand) is here merely alluded to. Furthermore, iterative techniques, such as that of Gauss-Seidel, are omitted, and the existence of such procedures merely noted.

The text is supplemented by approximately 40 diagrams, 13 tables (all relating to numerical differentiation and integration), and a bibliography of 17 selected references.

Numerous illustrative examples appear throughout, and exercises for the student are appended to each of the principal sections in all nine chapters.

The reviewer has noted a total of 22 typographical errors, which are relatively minor and are obvious, except on page 38, where the numerator of the logarithmic number I_9 should read 8183 instead of 8193. (This number is listed correctly on page 260 and in the table on page 262.)

Although the computational procedures therein are intended to be carried out on desk calculators, this book should serve as an introduction to numerical analysis for those students interested in high-speed computers and their applications.

J. W. W.

97[X].—N. YA. VILENKIN, *Successive Approximation*, Pergamon Press, Ltd., Oxford, England, distributed by The Macmillan Co., New York, 1964, ix + 70 pp., 23 cm. Price $2.25.