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.

Academic mathematics is principally concerned with the exact solution of ideally posed problems: practical mathematics requires mainly the approximate solution of problems deriving from models of acknowledged imperfection. The insistence on rigor necessary for the former is more often than not a positive hindrance when approaching the latter. In this book, which is written at the high school or freshman level, an attempt is made to acquaint the mathematician who wishes to be useful, with the facts of his life, not by brutal confrontation after he has taken his degree, but by preparation for them at an earlier age.

The book deals mainly with the solution of equations. By means of simple examples (a stone falling down a well, Achilles and the tortoise), the way in which equations arise in Physics and Engineering is illustrated. Iterative methods (the method of chords, Newton's method, etc.) are then discussed; their motivation is explained with the help of numerous diagrams, and some conditions for convergence are derived.

The standard of exposition is extremely high, and the book is attractively produced.

In view of the level at which the material is presented this book is hardly of interest to the research numerical analyst, nor will it command the direct attention of those teaching numerical analysis, but for the enterprising student and the inquisitive layman it is certainly a welcome addition to the literature.

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98[X].—CALVIN H. WILCOX, Editor, *Asymptotic Solutions of Differential Equations and Their Applications*, John Wiley & Sons, Inc., New York, New York, 1964, x + 249 pp., 23 cm. Price $4.95.

This book consists of the transactions of the symposium dedicated to Professor Langer and held at Madison, Wisconsin, May 4–6, 1964. Survey articles, as well as detailed presentation of recent results, are included. A careful reading of the book yields a very good idea of the methods of obtaining asymptotic solutions of differential equations, as well as their tremendous importance in the applications. Each article also contains a very good bibliography. The authors of the articles are: Clark, Erdélyi, Kazarinoff, Lewis, Lin, McKelvey, Olver, Sibuya, Turrittin, and Wasow.

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99[X, Z].—A. V. BALAKRISHNAN & LUCIEN W. NEUSTADT, Editors, *Computing Methods in Optimization Problems*, Academic Press, New York, 1964, x + 327 pp., 24 cm. Price $7.50.

This book is the Proceedings of a conference on Computing Methods in Optimization Problems held at UCLA in January, 1964. The papers appearing in this volume will be reviewed individually, and, by necessity, these reviews must be brief.

In the first paper, entitled "Variational theory and optimal control theory," by Magnus R. Hestenes (pp. 1–22), a general problem in optimal control is formu-