pected links between trigonometric series and algebraic numbers). The chapter gives a very exhaustive presentation of the situation as it exists now.

The last chapter is interesting for a different reason: it gives detailed proofs of a number of theorems little known outside Russia concerning the representation of an arbitrary measurable function by an almost everywhere convergent trigonometric series. That this is possible was first shown by Menshov some twenty years ago. Nina Bary completed the result by showing that the series can be obtained by termwise differentiation of the Fourier series of a continuous function. Of course, Menshov's series is not unique, and the problem whether the function can also take the value $+\infty$ in a set of positive measure still remains open (it is conjectured that no trigonometric series can diverge to $+\infty$ in a set of positive measure).

Volume II also terminates with a long list of appendices.

The English translation is graphically attractive but, unfortunately, it has a number of defects. Obvious mathematical misprints of the Russian original have been retained in the translation, and a number of serious distortions introduced. (To give examples from Chapter I: the expression "in the metric of the space L^2" of the original is systematically translated "in the metric space L^2"; in Steinhaus' theorem on p. 104 the word "equiconvergent" is replaced by "convergent" making the formulation incomprehensible; at the bottom of p. 110 we find the following passus: ". . . in fact, it can be proved that for a bounded function the partial sums of a Fourier series should be bounded. However, this is untrue even for continuous functions.") Such distortions are no real obstacle to a specialist, but may prove serious stumbling blocks to the beginner. Finally, one more point which, however, applies to many translations from Russian: references to Russian textbooks give pages of the original, even if the textbook has meanwhile been translated into English. Such references are useless for readers not familiar with the Russian language.

A. ZYGMUND

University of Chicago
Chicago, Illinois

39[X].—MARTIN BECKER, *The Principles and Applications of Variational Methods*, The M.I.T. Press, Cambridge, Massachusetts, 1964, vii + 120 pp., 24 cm. Price $5.00.

The present book is concerned with variational methods for solving problems in science and engineering. Various methods are described in detail, giving the advantages and disadvantages of each method. The author restricts himself mainly to "trial function methods" for solving an equation of the form $H\varphi = f$, where H is a given operator and f is a known function. In these methods a set of trial functions $\varphi_1, \cdots, \varphi_N$ are given. The problem is to determine a linear combination $a_1\varphi_1 + \cdots + a_N\varphi_N$ which is a "best" approximation to the solution φ of $H\varphi = f$. Particular attention is given to the method of least squares.

The book begins with the study of self-sufficient equations, that is, equations that are the Euler equations of a functional J. The method of adjoint functions is developed for non-self-sufficient problems. The method of weighted residuals is discussed as well as various methods for solving equations subject to constraints.

The author sets up a set of desirable criteria for variational methods and shows

that the method of least squares satisfies these criteria. Here constraints are handled by the method of penalty functions. Various special techniques for handling eigenvalue problems are given. A comparison of the least-squares method with others is made. The least-squares method is applied to the problem of fuel depletion in a nuclear reactor and the results are compared with those obtained by standard methods. Excellent results are obtained.

The book contains numerous examples which illustrate the effectiveness of the various methods employed. The basic theory upon which the method is based is summarized in appendices. No attempt is made to give a priori error estimates.

The book should prove to be useful to one who is interested in solving problems and to be instructive to one who is interested in theory. Many useful ideas are set forth. The examples are well chosen and illustrate difficulties as well as advantages of a particular method.

M. R. HESTENES

University of California
Los Angeles, California

40[X].—FRANCIS B. HILDEBRAND, *Methods of Applied Mathematics*, Second Edition, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1965, ix + 362 pp., 24 cm. Price $10.00.

This volume is the second edition of a book published originally in 1952. It consists of three long chapters entitled "Matrices and Linear Equations," "Calculus of Variations and Applications," and "Integral Equations." The first edition contained an additional chapter entitled "Difference Equations." This chapter has been removed and is to be expanded and published as a separate volume.

The material in each chapter is essentially independent of the other chapters. Each chapter is a brief but reasonably comprehensive treatment of the topic from an applied point of view. There are a large number of problems and a list of answers is given at the back of the book.

In order to fairly appraise the book it is necessary to consider it in conjunction with the author's text *Advanced Calculus for Applications*, together with his forthcoming book on difference equations and finite-difference methods. The present volume is an obvious extension of *Advanced Calculus for Applications*, containing additional topics which could not be included there. The two volumes can be nicely used in a three- or four-semester course on methods of applied mathematics at an intermediate level. The book can also be used for reference or self study. It is well written, and considerable care has been taken in introducing the topics in each chapter. It can be highly recommended if used as noted above.

RICHARD C. ROBERTS

41[X].—L. B. RALL, Editor, *Error in Digital Computation*, Volume I, John Wiley & Sons, Inc., New York, 1965, ix + 324 pp., 24 cm. Price $6.75.

This book is the proceedings of an advanced seminar conducted by the Mathematics Research Center, United States Army at the University of Wisconsin, October 5–7, 1964. As such it contains five papers based on the addresses of the invited speakers. The latter part of the book consists of a bibliography of books and papers on error analysis taken from the Mathematical Reviews.