●DORN, WILLIAM S.; AND McCRACKEN, DANIEL D. 23,813
Numerical methods with FORTRAN IV case studies.
John Wiley & Sons, New York, 1972, 447 pp. $13.95.

Many texts have been written covering the traditional problems in numerical methods. When a new book comes out in this area, one hopes to find something which will make this new one a better book. Of course, what one person considers better may not be the same as what another person does. To this reviewer, "better" means something different, more interesting examples, easier readability and some true innovations. Considering that both authors have been quite prolific, and have published some good books, one can expect a "better" text from them. I believe that this expectation has been fulfilled.

The topics are traditional: 1) Solution of Equations; 2) Errors; 3) Numerical Instabilities; 4) Simultaneous Linear Algebraic Equations; 5) Numerical Differentiation and Integration; 6) Interpolation; 7) Least Squares Approximation; and 8) Ordinary Differential Equations.

Topic 3, Numerical Instabilities, is an extension of the chapter on errors. A number of numerical examples are treated in great detail in regard to error analysis.

The authors are very explicit in their analysis of the types of errors and the causes of errors. In this chapter, as well as throughout the text, a number of programs are presented in FORTRAN IV. In addition to discussing errors in chapters 2 and 3, all examples worked out in the remainder of the text include an error analysis; this is one of the strongest points in the text. Far too often programmers are not experienced enough to analyze programs in regard to computational errors.

There are 13 case studies, each of which refers to a topic and procedure described in the text. The discussions for each case study are clear and detailed, and include flowcharts and programs. In addition, each chapter has a good selection of problems, with answers to some appearing in the back of the book. Bibliographic notes follow each chapter, which can be quite helpful. An annotated bibliography is found at the end of the text, containing brief analyses of the numerous texts in this field.

This is a text well worth considering for a course dealing with numerical applications. *R. Meyer*, Buffalo, N. Y.

5.11 Error Analysis; Computer Arithmetic

See: 23,823

5.12 Function Evaluation

MEINARDUS, G. 23,814
On a problem by L. Collatz.
Computing 8, 3–4 (1971), 250–254.

Some theorems concerning the number of zeros of a sum of trigonometric functions are derived.

Abstract

GADZHIEV, M. M. 23,815
Maximal length of the reduced disjunctive normal form for Boolean functions with five and six variables.
Diskretn. Analiz 18, Novosibirsk, USSR (1971), 3–24. (Russian)

The exact value is found for the maximal possible number $S(n)$ of product terms in the reduced disjunctive normal form for Boolean functions with five and six variables. It is shown that $S(5) = 32$, $S(6) = 92$, and that these values are attained for symmetric functions. *A. Sapozhenko*

A3039 Courtesy *Ref. Zh.* (1972), 3V343

5.13 Interpolation; Functional Approximation

●DUNAWAY, DONNA KASTLE. 23,816
A composite algorithm for finding zeros of real polynomials. (PhD Thesis)
Southern Methodist Univ., Dallas, Texas, Aug. 1972.

A composite algorithm has been designed for finding zeros of real polynomials. The algorithm has proved to be extremely successful in determining zeros of polynomials with a greater degree of accuracy and, in most cases, with greater speed than has been previously available. It has been particularly successful in efficiently calculating multiple zeros which cause trouble for most root-finding algorithms. The composite algorithm consists of several basic parts.

First, the input coefficients are scaled to minimize their variations of orders of magnitude. The scaled polynomial is then factored, through the use of the greatest common divisor of a polynomial and its derivative, into m factor polynomials, each possessing only simple zeros, m being the greatest multiplicity of any zero in the original polynomial. The real zeros of each factor polynomial are calculated by the use of Sturm's Theorem in combination with the Newton-Raphson method. An interpolating polynomial is formed which uniquely represents a polynomial having the complex zeros of the original polynomial. The zeros of the interpolating polynomial are found by an iterative procedure which uses rational function approximations along with the Lehmer-Schur method to obtain initial values. The calculated zeros are scaled according to the scale factor which modified the original input coefficients.

The composite algorithm has been tested on randomly generated polynomials having multiple zeros, as well as many other well- and ill-conditioned polynomials. It has proved to be computationally efficient, accurate, and fast. The results compare very favorably with those obtained using the Jenkins-Traub algorithm. *Abstract*

WOODFORD, C. H. 23,817
An algorithm for data smoothing using spline functions.
BIT 10, 4 (1970), 501–510.

An ALGOL procedure is given for calculating a function $g(x)$ that fits a set of data points (x_i, y_i) $(i = 1, 2, \ldots, n)$. Specifically, $g(x)$ has the property that $\int [g^{(m)}(x)]^2\, dx$ is minimal subject to the condition $\sum w_i\{g(x_i) - y_i\}^2 \leqslant S$, where w_i $(i = 1, 2, \ldots, n)$ and S are given constants. Therefore, $g(x)$ is a spline of degree $(2m - 1)$ whose knots are the data points. For the purposes of the ALGOL procedure $g(x)$ is expressed as a polynomial in each interval between data points, so there are $2m(n - 1)$ coefficients to