

The account of finite-difference methods is rather unsatisfactory. Difference methods seem to be largely discounted; for example Gregory's formula (p. 229) appears to be tacked on to section 11.3 almost as an after-thought (and is not referred to in the index). Central differences appear only as forward differences of decreasing argument; the practical advantages in computation of finite-difference formulae in general, and central-difference formulae in particular, are not clearly brought out.

There is a slip in Chapter 2. Equation (2.3.2) is clearly incorrect for $n = 0$, and similarly (2.3.3) and the next (unnumbered) equation are wrong for $m = n = 0$. On p. 131 the fourth equation (giving A_k) should be numbered (7.5.2), as reference to it is made on the next page. There is a misleading ambiguity near the foot of p. 51: the sentence "The elements of C are all continuous functions on $[a, b]$ " really means " C consists of all functions which are continuous on $[a, b]$ ".

Apart from these points, the reviewer is unhappy about the increasingly widespread use of "estimate" where "bound" would once have been used. These two words are common in non-technical use, and their non-technical meanings can easily be carried over into mathematics. It seems unfortunate that there should now be direct and unnecessary conflict between technical and non-technical meanings, exemplified by the sentence on p. 72: "Such an estimate is exact and cannot be decreased."

A similar, but less strong, objection is to the use of the word "approximate" as in the title of the book. The reviewer would prefer the adjective "numerical" in such places, reserving "approximate" for methods which are less precise than those considered here with full regard for their remainders.

These criticisms are all comparatively minor if the book is regarded primarily as a text for teaching purposes. It is a most welcome addition to the literature of numerical analysis. The author is readable and clear in his exposition (and in this matter we are indebted to the translator for doing so much more than produce a passable translation). Numerical examples are included wherever helpful. At the same time, rigour is never sacrificed; remainder and truncation errors are carefully examined at all relevant stages. It is good to see advice (stressed in Chapter 11) to consider the application of mathematical analysis before embarking upon numerical analysis, with examples showing the advantages which may thereby accrue. We should indeed be grateful that the first textbook devoted to numerical integration has proved so thorough.

C. W. CLENSHAW

FETTIS, H. E. (1955). "Numerical Calculation of Certain Definite Integrals by Poisson's Summation Formula," *Math. Tab. Wash.* Vol. 9, p. 85.

GOODWIN, E. T. (1949). "The Evaluation of Integrals of the Form $\int_{-\infty}^{\infty} f(x)e^{-x^2} dx$ ", *Proc. Camb. Phil. Soc.*, Vol. 45, p. 241.

Selected Numerical Methods, edited by CHRISTIAN GRAM, 1962; 308 pages. (Copenhagen: Gjellerup, Solvgade 83. D.Kr. 70.)

This book contains an extremely useful collection of numerical methods well suited to automatic computation. It is the

work of a Danish study group in numerical analysis, sponsored by the Carlsberg Foundation. The authors modestly state that the aim has been to collect and evaluate the methods and experience of computer users in many parts of the world, rather than to present new results. Throughout the book theory and practice are presented side-by-side, and the authors' own considerable experience in these matters appears, in a most helpful way, in the form of ALGOL programs (written for and tested on the DASK computer). The book consists of four parts, of very unequal length. The policy has been, rightly I feel, to emphasize the less familiar areas of numerical analysis.

Part I, by Chr. Andersen and T. Krarup, deals with linear equations. Direct methods are considered briefly and there is a discussion of iterative methods, with particular reference to the choice of optimum relaxation factors for successive over-relaxation methods.

Part II, by C. Gram, P. Naur and E. T. Poulsen, is concerned with partial differential equations, but only (linear) elliptic and parabolic equations are studied at length. The section dealing with the solution of the Dirichlet problem for linear, elliptic equations of the second order is largely an extension of Part I (Solution of Linear Equations). ALGOL programs are given for the solution of Laplace's equation by a 5-pt. formula, a 9-pt. formula and the Implicit Alternating Direction Method of Peaceman and Rachford. The heat equation is treated in some detail, with a good discussion of the convergence and stability of finite-difference methods, and an error analysis of the Crank-Nicholson method. An interesting ALGOL procedure is presented for the integration of the heat equation, in one dimension, with facilities for automatic adjustment of step sizes in x and t to keep the error within a given tolerance.

The third chapter is "Conformal Mapping" by Chr. Andersen, S. E. Christiansen, O. Møller and H. Tornehave. This is the largest part of the book, almost half the entire length, and could well have been published by itself. It is a very comprehensive account of a subject which is not normally treated numerically. It opens with a very thorough discussion of the problem of mapping one region into another, such as aerofoil sections into circles. This leads to a lengthy treatment of integral equation methods, particularly those leading to linear equations which are solved by iteration. Some of the methods presented have only been investigated theoretically so far, and no information is available about their numerical behaviour. The chapter ends with an account of the method of successive approximation used by Krylov and Kantorovitch for the mapping of nearly circular regions on to the unit disc. ALGOL programs for conformal mappings are presented.

The fourth and last chapter, "Polynomial Equations" by Th. Busk and Bj. Svejgaard, gives a rather superficial survey of available methods. Here the authors have been very selective: for example, we find the (rare) method of root-cubing but not Rutishauser's quotient-difference algorithm. Some useful results are mentioned on the approximate location of roots and bounds for them.

There is a good bibliography.

In spite of its unevenness and shortcomings, this book can be warmly recommended as a work of reference which should be generally available.

P. A. SAMET