one-dimensional integration and a discussion of periodization in quasi-Monte Carlo rules for multidimensional integration.

There are more than the usual quota of typographical errors and many questionable statements as well as much material which could use further elaboration. However, in spite of its shortcomings, the book serves a useful purpose and should be of benefit to the audience to whom it is addressed.

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15[65–00, 65–02, 65D30].—H. V. SMITH, *Numerical Methods of Integration*, Studentlitteratur, Chartwell-Bratt, Kent, England, 1993, iv + 147 pp., $22\frac{1}{2}$ cm. Price: Softcover $17.00.

This reference monograph summarizes a class of one-dimensional quadrature methods. Typically, the results given are presented in the form

$$\int_a^b w(x)f(x)\,dx = \sum_{j=1}^{n} w_j f(x_j) + E_n(f),$$

along with explicit descriptions for the weights, w_j, the abscissae, x_j, and the error term, $E_n(f)$. In addition, the author often adds brief comments on the evaluation of the sum approximating the integral, or on the error term. Although derivations of the formulae are omitted in the monograph, references are given to paper publications where the formulae are derived and discussed in detail. In addition, one finds worked examples illustrating the application of the formulae, as well as supplementary problems at the end of each chapter.

The monograph is divided into the following chapters:

1. Newton-Cotes Quadrature
2. Gauss-Type Quadrature Rules
3. Chebyshev Polynomials
4. The Error Term
5. Kronrod Quadrature
6. Oscillatory/Periodic Integrals
7. Integrals Involving Singularities
8. Infinite, Semi-Infinite Integrals
9. Divergent Integrals

These titles are sufficiently descriptive to give the reader an idea of the content of each chapter.

At the end of the monograph, one also finds several pages devoted to each of the following:

(i) Solution to Selected Supplementary Problems
(ii) Appendix A. NAG
(iii) Appendix B. Tables
(iv) Bibliography
(v) Index

The above headings (i), (iv) and (v) are sufficiently descriptive to make their content self-explanatory. The Appendix A, NAG, contains a brief reference to the use of the quadrature routines in the NAG (Numerical Analysis Group Project) Library, which was developed collectively by five British universities.

The tables in Appendix B are tables of numbers which may be used to obtain global error bounds, as explained in the monograph, for Gauss-Legendre, Gauss-Chebyshev, Newton-Cotes, Lobatto, and Radau quadrature.

The text is mainly a reference text, even though it contains some good problems which weigh its purpose towards the direction of instruction.

F.S.

16[41A55, 65D30, 65D32].—H. Brass & G. Hämmerlin (Editors), *Numerical Integration* IV, International Series of Numerical Mathematics, Vol. 112, Birkhäuser, Basel, 1993, xii + 382 pp., 24 cm. Price $100.50.

This is the fourth volume of Proceedings of Conferences on Numerical Integration in which Professor Hämmerlin has been either the Editor or Coeditor. The Proceedings of the previous three Conferences have also been published in this International Series of Numerical Mathematics (see Vols. 45, 47 and 85). Of these four volumes this latest one is by far and away the best produced and bound; the publishers, Birkhäuser, have done an excellent job. In this volume we find 27 refereed papers (see Contents, below) together with an addendum containing nine unsolved problems. This Conference, held at the Oberwolfach Mathematics Research Institute, was attended by 46 mathematicians from 16 different countries with at least one delegate from each of the 5 Continents.

To misquote slightly from the Preface to the Third Edition of Gabor Szegö's book on Orthogonal Polynomials, "The interest of the mathematical community for numerical integration is still not entirely exhausted". This is perhaps surprising in the light of the Editors' statement that "Algorithms for the numerical computation of definite integrals have been proposed for more than 300 years, ... ". However, the Editors go on to say that ... "practical considerations have led to problems of ever increasing complexity so that, even with current computing speeds, numerical integration may be a difficult task. High dimension and complicated structure of the region of integration and singularities of the integrand are the main sources of difficulties". Of the 27 papers, 17 were on one-dimensional, and 10 on multivariate approximate integration. Of the papers on one-dimensional quadrature nearly all of them (13) relate to either orthogonal polynomials or Gauss quadrature. It seems that orthogonal polynomials are in great demand in numerical integration; Gabor Szegö would, I am sure, be pleased.

To underline the continuing interest in numerical integration, this volume concludes with a report of one of the evenings of the Conference at which open problems were discussed. A total of nine problems is listed, eight of them concerning one-dimensional quadrature rules. In the tradition of Paul Erdös, it is stated that Frank Stenger is offering a 50 DM reward for a solution to the problem he proposed. (An e-mail to Frank on 26th April 1994 elicited the response that his problem remains unsolved and so keen is he to have it resolved one way or the other that he is now offering US$100 in place of the original DM50.)

Following the Oberwolfach tradition, all the papers, with one exception, are