9[41–06, 41A63].—C. K. CHUI, W. SCHEMPP & K. ZELLER (Editors), *Multivariate Approximation Theory*, International Series of Numerical Mathematics, Vol. 90, Birkhäuser, Basel, 1989, ix + 342 pp., 24 cm. Price $63.00.

Interest in Multivariate Approximation Theory has increased considerably in the past few years because of its important applications in diverse areas of science and engineering. Multivariate approximation methods have always been important for data interpolation and approximation, cubature, and for the numerical solution of boundary value problems (the finite element method). More recently, multivariate approximation methods have assumed an important role in CAD/CAM (computer-aided design and manufacture), robotics, image processing, pattern recognition, signal processing, and elsewhere.

The keen interest in the field has resulted in a considerable increase in both the number of publications in the area (several new journals have been started in the past few years), and in the number of conferences being held on the subject. The book under review is the proceedings of one such recent conference held at Oberwolfach, Germany from February 12 to 18, 1989.

The book contains 37 complete research papers. Eight of the papers deal with multivariate splines of one sort or another (for example, the dimension and construction of local bases, box splines, blending, vector spherical splines, polyharmonic splines, and exponential eigensplines). Another group of seven papers deals with periodic interpolation and approximation (including sampling theorems, cardinal interpolation, Fourier integrals and transforms, trigonometric operators, convolution methods, Hermite-Birkhoff interpolation, and Bochner-Riesz means). Several papers deal with polynomials and rational functions (L_p approximation, Bernstein methods, quasi-interpolation). Two papers deal with radial basis functions, and two with band-limited functions. There are also papers on cubature, wavelets, and on holograms and neural networks. The book will be of interest to approximation theorists and to all parties who make use of approximation methods.

L. L. S.

10[41–01, 41A15, 68U05].—SU BU-QING & LIU DING-YUAN, *Computational Geometry: Curve and Surface Modeling*, Academic Press, Boston, 1989, x + 295 pp., $23\frac{1}{2}$ cm. Price $39.95.

Mathematical methods for dealing with curves and surfaces are important tools in a number of traditional areas (such as data interpolation and fitting, quadrature and cubature, and numerical solution of operator equations such as ordinary and partial differential equations, integral equations, etc.). More recently, they have become increasingly important in several newer, rapidly developing areas such as CAD/CAM (computer-aided design and manufacture), robotics, and image processing. This increased interest has spawned numerous publications, several new journals, a plethora of conferences, and several books.

The book under review treats mathematical properties of some function classes which are particularly useful for curve and surface *modelling*. It is a translation of a book originally published in Chinese some ten years earlier. The book can be read by anyone acquainted with calculus and linear algebra (but of course will be better appreciated by those with some knowledge of numerical analysis and approximation theory). It should be of special interest to both researchers and practitioners working with CAD.

The first chapter of the book is an introduction to the field. Except for one short chapter on surfaces, the remainder of the book deals with planar curves. The second chapter introduces splines, concentrating on the cubic and quartic cases. Chapters 3 and 4 discuss parametric and Bézier methods for fitting and modelling curves in the plane. Bicubic splines and Coon's and Bézier patch methods are treated in Chapter 5 on surfaces. The remaining three chapters deal with nonlinear splines (including the mechanical spline), with curve and net fairing, and with affine invariants of parametric curves.

Despite the fact that the book was written more than ten years ago, I think it will be a very useful supplement to more recent books on splines, curve and surface fitting, and computer-aided geometric design. In particular, there is a great deal of information about affine invariants and the characterization of inflection points and singular points (leading to loops and cusps) which is not treated in other books. In general, the authors have adhered to modern notation and terminology (referring to the control polygon as a characteristic polygon is one exception), and the translator has done an excellent job of rendering the text in very readable smooth English. The book has very few obvious misprints, and benefits from a large number of well-drawn figures.

L. L. S.

11[41-02, 41A60].—R. WONG, *Asymptotic Approximation of Integrals*, Computer Science and Scientific Computing, Academic Press, Boston, 1989, xiii+543 pp., $23\frac{1}{2}$ cm. Price $69.95.

J. E. Littlewood once remarked on the fading—with the growing emphasis on rigor—of the "aroma of paradox and audacity" that had pervaded the subject of divergent series—those curious expansions that were usually divergent but nevertheless from which information could be obtained. It is true that the subject now resides on a firm theoretical foundation, but for most of us the scent still clings to what for Abel was "the invention of the devil." Some of this mystery is shared by asymptotic expansions—typically a kind of divergent series—and probably constitutes a large part of their appeal: they represent a let-it-all-hang-out approach to mathematics, a swift uppercut to the fatiguing demands of rigor. Asymptotics constitutes a collection of powerful tools, and if we are sometimes a little careless in devising and using them, perhaps they provide us with what we secretly want: to be both naughty and effective.

There are still vital matters to be resolved in asymptotic analysis. At least one widely quoted theory, the asymptotic theory of irregular difference equations