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REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

The numbers in brackets are assigned according to the American Mathematical Society classification scheme. The 1991 Mathematics Subject Classification can be found in the annual subject index of *Mathematical Reviews* starting with the December 1990 issue.

12[65-06]—*Proceedings of the Third International Conference on Spectral and High Order Methods*, Andrew V. Ilin and L. Ridgeway Scott (Editors), Houston Journal of Mathematics, Houston, Texas, 1996, viii+613 pp., $27\frac{1}{2}$ cm, softcover, $49.00

This is the third volume of proceedings from an ongoing series of conferences, held every third year so far, devoted to the subject of "Spectral and High Order Methods". The volume is divided into overlapping "chapters" devoted to spectral methods, finite elements, spectral elements, finite differences, domain decomposition, h-p methods, multigrid methods, and parallel computations.

In brief, these proceedings mirror the general landscape of computation but with added emphasis on higher order methods. Many numerical analysts, including myself, hold it as an "article of faith" that higher order (stable) methods are "better" than low order methods even in nonsmooth problems where the "higher order" will not come through; at the least they are not "worse". Some of the articles here substantiate this "article of faith".

Lars B. Wahlbin

13[53-01, 06Y25, 68U05]—*An introduction to computational geometry for curves and surfaces*, by Alan Davies and Philip Samuels, Oxford University Press, New York, NY, 1996, viii+205 pp., 24 cm, hardcover, $35.95

The problem of how to design, store, manipulate, and display curves and surfaces with a digital computer has become of increasing importance in recent years, and there are several books (and many proceedings volumes) on the subject. This book provides a novel introduction which may be especially useful to students and beginners.

The book is divided into two parts. The first four chapters deal with the differential geometry of curves and surfaces. They treat the standard topics of parametrizations, curvature, torsion, Frenet frames, envelopes, fundamental forms, geodesics, and the Dupin indicatrix. The Weingarten matrix and the Gauss map are also dealt with.

The second four chapters discuss many of the standard ways of dealing with curves and surfaces. For curves these include Lagrange and Hermite interpolation, cubic splines, Bezier and Ferguson curves, NURBS, and composite curves. For surfaces, they include Coons, bicubic, Bezier, rational, tensor product, and spline patches. The book concludes with a very limited bibliography.

The book is not meant to be a state-of-the-art monograph and has been designed to be read by both undergraduates and graduates. There are some theorems and proofs, many examples, and an extensive set of problems. A novel feature of the book is the inclusion of full solutions of all problems which should make the book particularly useful for self study.

JOSEPH D. WARD

14[65D17]—*The mathematics of surfaces*, IV, Glen Mullineux (Editor), Oxford University Press, New York, NY, 1996, xiv+569 pp., 24 cm, cloth, $145.00

These are the proceedings from a conference at Brunel University in 1994. While otherwise a typical "Proceedings", it is distinguished by the two articles of R. E. Barnhill and N. Dyn on the work of the late John Gregory ("From computable error bounds through Gregory's square to convex combinations", and "Rational spline interpolation, subdivision algorithms and C^2 polygonal patches", respectively).

LARS B. WAHLBIN

15[11A05, 11A51, 11A55, 11T06, 11Y11, 11Y16, 68Q25]—*Algorithmic number theory, Volume* I: *Efficient algorithms*, by Eric Bach and Jeffrey Shallit, The MIT Press, Cambridge, MA, 1996, xvii+512 pp., $23\frac{1}{2}$ cm, hardcover, $55.00

This book treats the design and analysis of algorithms for solving problems in elementary number theory for which more or less efficient algorithms are known. For example, good algorithms are known for testing large integers for primality, but none are known for factoring large composite integers. Primality testing appears in Chapter 9 of this book, while factoring is reserved for a projected second volume.

Algorithmic number theory is one of the principal sources of examples of problems in complexity classes studied in theoretical computer science. This is especially true for the randomized or probabilistic complexity classes. For example, let $\mathcal{RP}$ denote the class of languages (sets) L for which there is a randomized algorithm (one which can choose random numbers) whose running time is bounded by a polynomial in the size of the input, which accepts inputs in L (says that the input is an element of L if it really is in L) with probability ≥ 0.5, and which rejects every input not in L (says that the input is not in L whenever it really is not in L). The algorithm is allowed to assert that an input is not in L when it really is in L, provided that this happens for no more than half of the choices of random numbers. An algorithm in class $\mathcal{RP}$ is called a Monte Carlo algorithm.

Let `COMPOSITE` be the language of composite numbers, that is, the set of binary representations of all composite positive integers $\{4, 6, 8, 9, 10, \dots\}$. Here is a Monte Carlo algorithm which shows that `COMPOSITE` is in the complexity class $\mathcal{RP}$. Let