Buchanzeigen

Buchanzeigen

Chaos in Discrete Dynamical Systems. A Visual Introduction in 2 Dimensions. By Ralph Abraham, Laura Gardini and Christian Mira. (Springer Verlag, Berlin Heidelberg New York London Paris Tokyo Hong Kong 1997.) XXV, 246 pp., Hardcover sFr. 81.00; DM 89.00 – ISBN 3–540–94300–5.

Chaos Theory is a synonym for dynamical systems theory, a branch of mathematics. Dynamical systems come in three flavors: flows (continuous dynamical systems), cascades (discrete, irreversible, dynamical systems). Flows and semi-cascades are the classical systems introduced by Poincaré a century ago, and are the subject of the extensively illustrated book: "Dynamics: The Geometry of Behavior," Addison-Wesley 1992 authored by Ralph Abraham and Shaw. Semi-cascades, also known as iterated function systems, are a recent innovation, and have been well-studied only in one dimension (the simplest case) since about 1950. The two-dimensional case is the current frontier of research. And from the computer graphics of the leading researcher come astonishing views of the new landscape, such as the Julia and Mandelbrot sets in the beautiful books by Heinz-Otto Peitgen and his co-workers. Now, the new theory of critical curves developed by Mira and his students and Toulouse provide a unique opportunity to explain the basic concepts of the theory of chaos and bifurcations for discrete dynamical systems in two-dimensions.

The materials in the book and on the accompanying disc are not solely developed only with the researcher and professional in mind, but also with consideration for the student. The book is replete with some 100 computer graphics to illustrate the material, and the CD-ROM contains full-color animations that are tied directly into the subject matter of the book, itself. In addition, much of this material has also been class-tested by the authors. The cross-platform CD also contains a software program called ENDO, which enables users to create their own 2-D imagery with X-Windows.

Solving Problems in Scientific Computing Using Maple and MATLAB. By Walter Gander and Jiri Hrebicek. 3rd exp. and rev. ed. (Springer Verlag, Berlin Heidelberg New York London Paris Tokyo Hong Kong 1997.) XVIII, 408 pp., Softcover sFr. 69.00; DM 78.00 – ISBN 3–540–61793–0.

From the review: "... An excellent reference on undergraduate mathematical computing." (American Mathematical Monthly). "... manuals for such systems (Maple and MATLAB) tend to use trivial examples, making it difficult for new users of such systems to quickly apply their power to real problems. The authors have written a good book to address this need. ... the book is worth buying if you want guidance in applying Maple and MATLAB to problems in the workplace..." (Computing Review). "... The presentation is unique, and extremely interesting. I was thrilled to read this text, and to learn the powerful problem-solving skills presented by these authors. I recommend the text highly, as a learning experience, not only to engineering students, but also to anyone interested in computation." (Mathematics of Computation). The 3rd expanded and revised edition contains six new contributions, by such experts as Gaston Gonnet and Walter Gautschi.

Springers Mathematische Formeln. Von L. Rade, Göteborg, Schweden, und B. Westgren, Göteborg, Schweden. Bearbeitet und aus dem Englischen übersetzt von P. Vachenauer, München. (Springer Verlag, Berlin Heidelberg New York 1996.) Ca. 544 pp., 355 fig.; 500 Tab. sFr. 43.00- ISBN 3-540-60476-6.

Dieses völlig neu konzipierte Handbuch bietet in moderner, übersichtlicher und handlicher Aufmachung mathematische Formeln, Tabellen, Definitionen und Sätze – nicht im Sinne einer Einführung, sondern zum schnellen und sicherer Nachschlagen. Neben der klassischen Disziplinen wie Algebra, Geometrie und Analysis stehen Gebiete von aktuellern Interesse wie Wahrscheinlichkeitsrechnung, Statistik, und Numerik. Der Anwender findet Begriffe der neuesten Mathematik wie nichtlineare und dynamische Optimierung, Kodierung, Schnelle Fouriertransformation, Graphen und Digraphen. Das neue Standard-Nachschlagewerk für Studenten und Dozenten der Höheren und Ingenieur-Mathematik, Natur- und Ingenieurwissenschaften – obendrein die ideale Ergänzung zur „Höheren Mathematik" von Meyberg und Vachenauer.

Aus dem Inhalt: Grundlagen, diskrete Mathematik, Algebra, Geometrie udn Trigonometrie, lineare Algebra, elementare Funktionen, Differentialrechnung einer Veränderlichen, Integralrechnung, Folgen und Reihen, gewöhnliche Differentialgleichungen, Differentiation und Integration in höheren Dimensionen, Vektoranalysis, orthogonale und andere Funktionensysteme, Transformationen, komplexe Analysis, Optimierung, numerische Analysis und Programmierung, Wahrscheinlichkeitstheorie, Statistik, Verschiedenes.

Variational Methods: Applications to Nonlinear Partial Differential Equations and Hamiltonian Systems. By M. Struwe, ETH Zurich, Switzerland. (Springer Verlag, Berlin Heidelberg New York 1996.) Second revised and substantially expanded edition. XVI, 272 pp., 16 fig.; (Ergebnisse der Mathematik und ihrer Grenzgebiete, Dritte Folge / A Series of Modern Surveys in Mathematics, Vol. 34) sFr. 138.00- ISBN 3-540-58859-0.

Hilbert's talk at the second International Congress of 1900 in Paris marked the beginning of a new era in the calculus of variations. A development began which, within a few decades, brought tremendous success, highlighted by the 1929 theorem of Ljusternik and Schnirelman on the existence of three distinct prime closed geodesics on any compact surface of genus zero, and the 1930/31 solution of Plateau's problem by Douglas and Radó. The book gives a concise introduction to variational methods and presents an overview of areas of current research in this field. This new edition has been substantially enlarged, a new chapter on the Yamabe problem has been added and the references have been updated. All topics are illustrated by carefully chosen examples, representing the current state of the art in their field.

Introduction to Scientific Programming: Computational Problem Solving Using Maple and C. By J. Zachary, University of Utah, Salt Lake City, UT, USA. (Springer Verlag, Berlin Heidelberg New York 1996.) Approx. 420 pp., with MS-DOS diskette; sFr. 69.00- ISBN 0-387-94630-6.

Introduction to Scientific Programming was developed over a period of two years at the University of Utah, Department of Computer Science in conjunction with the U.S. Department of Energy-funded Undergraduate Computation in Engineering Science (UCES) program. Each chapter begins by introducing a problem and then guiding the student through its solution. The computational techniques needed to solve the problem are developed as necessary, making the motivation for learning always apparent. Each chapter will introduce a single problem that will

be used to motivate a single computing concept. The notes currently consist of 15 chapters. The first seven chapters deal with Maple and the last eight with C. The textbook will contain 20 to 30 chapters covering a similar mix of concepts at a finer level of detail.

Optimization. Algorithms and Consistent Approximations. By Elijah Polak. Applied Mathematical Sciences, Vol.124. F. John, J.E. Marsden, L. Sirovich (Eds.). (Springer Verlag, Berlin Heidelberg New York London Paris Tokyo Hong Kong 1997.), Hardcover sFr. 104.00; DM 118.00 – ISBN 0–387–94971–2.

This book covers algorithms and discretization procedures for the solution of nonlinear programming, semi-infinite optimization and optimal control problems. Among the important features included are the theory of algorithms represented as point-to-set maps, the treatment of min-max problems with and without constraints, the theory of consistent approximation which provides a framework for the solution of semi-infinite optimization, optimal control, and shape optimization problems with very general constraints, using simple algorithms that call standard nonlinear programming algorithms as subroutines, the completeness with algorithms are analyzed, and chapter 5 containing mathematical results needed in optimization from a large assortment of sources.

Readers will find of particular interest the exhaustive modern treatment of optimality conditions and algorithms for min-max problems, as well as the newly developed theory of consistent approximations and the treatment of semi-infinite optimization and optimal control problems in this framework. This book presents the first treatment of optimization algorithms for optimal control problems with state-trajectory and control constraints, and fully accounts for all the approximations that one must make in their solution. It is also the first to make use of the concepts of epi-convergence and optimality functions in the construction of consistent approximations to infinite dimensional problems.

Visualization and Mathematics. Experiments, Simulations and Environments. By H.-C. Hege and K. Polthier (Eds.), (Springer Verlag, Berlin Heidelberg New York London Paris Tokyo Hong Kong 1997) XIX, 386 pp. Hardcover sFr. 121.50; DM 138.00– ISBN 3-540-61269-6.

Visualization and mathematics have begun a fruitful relationship, establishing links between problems and solutions of both fields. In some areas of mathematics, like differential geometry and numerical mathematics, visualization techniques are applied with great success. However, visualization methods are relying heavily on mathematical concepts.

Applications of visualization in mathematical research and the use of mathematical methods in visualization have been topic of an international workshop in Berlin in June 1995. Selected contributions treat topics of particular interest in current research. Experts are reporting on their latest work, giving an overview on this fascinating new area. The reader will get insight to state-of-the-art techniques for solving visualization problems and mathematical questions.