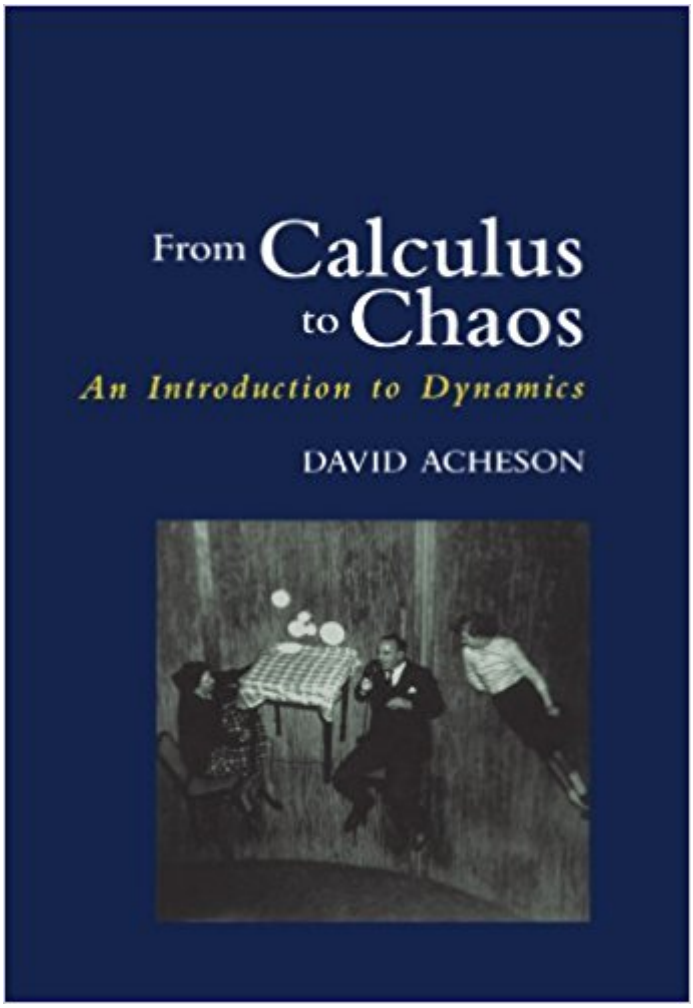
From Calculus To Chaos: An Introduction To Dynamics



Synopsis

What is calculus really for? This book is a highly readable introduction to applications of calculus, from Newton’s time to the present day. These often involve questions of dynamics, i.e., of how--and why--things change with time. Problems of this kind lie at the heart of much of applied mathematics, physics, and engineering. From Calculus to Chaos takes a fresh approach to the subject as a whole, by moving from first steps to the frontiers, and by focusing on the many important and interesting ideas which can get lost amid a snowstorm of detail in conventional texts. The book is aimed at a wide readership, and assumes only some knowledge of elementary calculus. There are exercises (with full solutions) and simple but powerful computer programs which are suitable even for readers with no previous computing experience. David Acheson’s book will inspire new students by providing a foretaste of more advanced mathematics and some of its liveliest applications.

Book Information

Paperback: 280 pages

Publisher: Oxford University Press; 1 edition (January 8, 1998)

Language: English

ISBN-10: 0198500777

ISBN-13: 978-0198500773

Product Dimensions: 9.1 x 0.7 x 6.1 inches

Shipping Weight: 1.1 pounds (View shipping rates and policies)

Average Customer Review: 4.5 out of 5 stars 2 customer reviews

Best Sellers Rank: #659,910 in Books (See Top 100 in Books) #87 inÃ Â Books > Science & Math > Physics > Chaos Theory #106 inÃ Â Books > Science & Math > Physics > Applied #998 inÃ Â Books > Textbooks > Science & Mathematics > Mathematics > Calculus

Customer Reviews

"Despite public interest, it has been difficult to find a suitable introductory book on chaos for mathematics students. In ’From Calculus to Chaos’, David Acheson manages to bridge the gap, tie the topic into the undergraduate curriculum, throw in some history and practical techniques, and tell readers about an experimental basis of dynamical systems theory--all this without being stuffy."--New Scientist"This is a thoroughly excellent little book and a most valuable addition to the literature on dynamics. Its approach is quite unique, bringing together a vast range of real physical phenomena and elucidating the essential dynamics by means of well chosen toy models in the form of differential equations. All the necessary analytical techniques are slipped in with the minimum of

fuss, and numerical methods are employed throughout in such a way that the reader is encouraged to use the computer as an experimental tool. . . .the book deserves a place on the shelves of all serious students, teachers, and researchers." --UK Nonlinear News"The book is quite suitable as a text in dynamics and can serve as a refresher for those wishing to see how applied math courses they struggle through can be made simple."--Bulletin of the American Meteorological Society"This short introductory-level book illustrates several important ideas of contemporary research in nonlinear dynamics by the numerical solution of rigid solids and fluids examples. . . .[m]ost of the complex phenomena currently studied in nonlinear dynamics are modeled by equations whose properties can only be uncovered by numerical methods or by more oblique analytic attacks on their qualitative behavior. Students would likely be more successful if they have this library of physical examples with which to test ideas." --Applied Mechanics Reviews"Acheson presents an introduction to the calculus-based development of dynamics (continuous dynamical systems). The text is a beautiful historical review of physical mathematics from Newton and Leibniz to Lorenz in the late 20th century. It begins with a brief review of projectile and planetary motion and related topics in calculus and differential equations, including numerical (computer) solutions and the theory of oscillations. Later chapters discuss more advanced topics: the three-body problem, wave and diffusion equations, action and Hamilton’s principle, calculus of variations, Lagrange’s equations, fluid flow, theory of linear stability, bifurcation and catastrophic change, nonlinear oscillations, and the Lorenz equations. . . . an excellent overview of a broad body of material in a historically accurate setting. Chapter exercises; appendixes with solutions to exercises and an elementary introduction to programming in QBASIC. Undergraduates through professionals."--Choice"The book under review falls into the category of ’books I would have liked to have read in high school and first year in college, and then I would have been much better off’. Indeed, this is a very attractive introduction to a number of topics in dynamics, understood widely to include classical mechanics, wave motion, fluid flow, etc. The author has given us earlier another well-written and frequently cited textbook . . . , and here we find again the same laudable style of exposition."--Mathematical Reviews"Mathematics and Physics have always had close connections, it seems. In fact, the boundaries between the two subjects have been quite fluid over time. Not too long ago, Newtonian mechanics . . . was a part of mathematics, and number theory and algebraic geometry were the purest of pure mathematics. Things look different now. It also used to be the case that all mathematicians knew lots of physics, or at least theoretical physics. That, too, is no longer the case. Many mathematicians have never even had a course in theoretical mechanics. David Acheson’s From Calculus to Chaos is a book that can remedy that lack. It is a friendly introduction to dynamics

that uses historical vignettes, well-chosen examples, and computer simulation to survey the field and show us, in the words of the blurb writer, what the calculus is really for."--The Mathematical Association of America

Dr D.J. Acheson Jesus College Oxford OX1 3DW Tel: 01865 279700 Fax: 01865 279687 Email: david.acheson@jesus.ox.ac.uk

this is an excellent discussion of differential equations from a historical (and very knowledgable) point of view.the author is an experienced applied mathematician, and he introduces ideas about "phase space" andnon-linearity early and often. unfortunately this book went out of print fairly quickly. there is an excellentcompanion text, on fluid dynamics (which may be easier to find).

The author manages to express in an easily understandable form many of the more interesting applications of calculus, from planetary motion to the Indian Rope Trick (almost). This book is ideally suited for first year undergraduates and sixth-formers with a strong interest in Mechanics. All those doing maths at Oxford University MUST buy this book (the author spends most of the lectures making references to it and to not buy the book would be to not understand the mechanics course).

Transcendentals, 8th (James Stewart Calculus) Single Variable Calculus: Early Transcendentals Plus MyMathLab with Pearson eText -- Access Card Package (2nd Edition) (Briggs/Cochran/Gillett Calculus 2e) Student Solutions Manual, Chapters 1-11 for Stewart's Single Variable Calculus, 8th (James Stewart Calculus) Calculus On Manifolds: A Modern Approach To Classical Theorems Of Advanced Calculus Calculus For Biology and Medicine (3rd Edition) (Calculus for Life Sciences Series) Calculus 1 (APEX Calculus v3.0) (Volume 1) Finite Mathematics and Calculus with Applications Plus MyMathLab with Pearson eText -- Access Card Package (10th Edition) (Lial, Greenwell & Ritchey, The Applied Calculus & Finite Math Series)