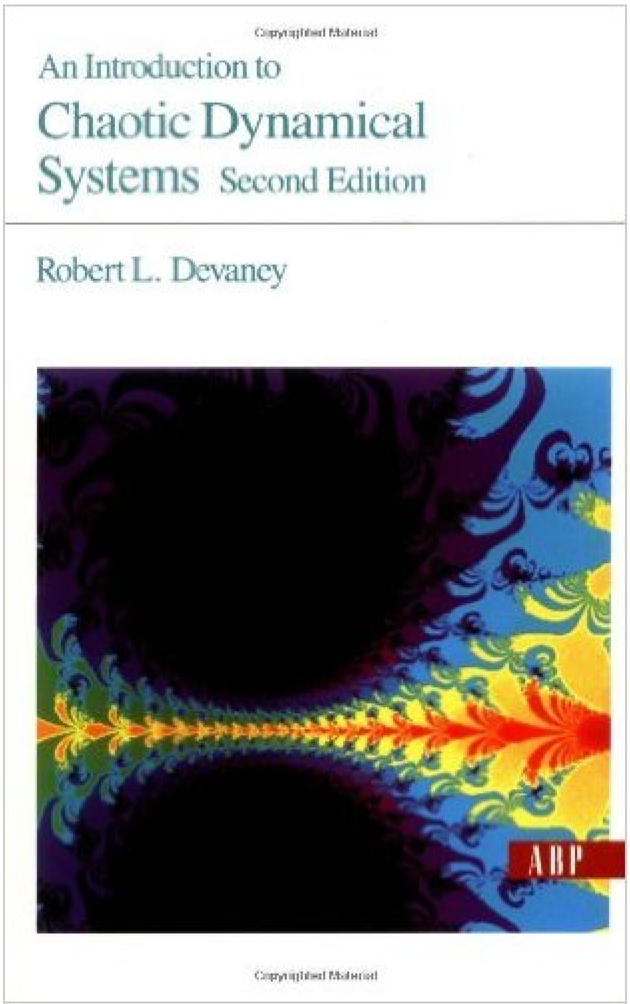
An Introduction To Chaotic Dynamical Systems, 2nd Edition



Synopsis

The study of nonlinear dynamical systems has exploded in the past 25 years, and Robert L. Devaney has made these advanced research developments accessible to undergraduate and graduate mathematics students as well as researchers in other disciplines with the introduction of this widely praised book. In this second edition of his best-selling text, Devaney includes new material on the orbit diagram fro maps of the interval and the Mandelbrot set, as well as striking color photos illustrating both Julia and Mandelbrot sets. This book assumes no prior acquaintance with advanced mathematical topics such as measure theory, topology, and differential geometry. Assuming only a knowledge of calculus, Devaney introduces many of the basic concepts of modern dynamical systems theory and leads the reader to the point of current research in several areas.

Book Information

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Customer Reviews

This book gives a quick and elementary introduction to the field of chaotic dynamical systems that could be read by anyone with a background in calculus and linear algebra. The approach taken by the author is very intuitive, lots of diagrams are used to illustrate the major points, and there are many useful exercises throughout the book. It could serve well in an undergraduate mathematics course in dynamical systems, and in a physics undergraduate course in advanced mechanics. The author emphasizes the mathematical aspects of dynamical systems, and readers will be well prepared after finishing it to read more advanced books on dynamical systems.Chapter 1 introduces one-dimensional dynamics, with the analysis of the quadratic map given particular attention. Called the logistic map in some circles, this very important dynamical system has been the subject of much study, and exhibits generically the properties of chaotic dynamical systems. The author also gives a brief review of some elementary notions in calculus needed for the chapter, making the book even more accessible to a wider readership. The important concept of hyperbolicity is discussed in the context of one-dimensional maps and a good discussion is given on symbolic dynamics. Structural stability, which is really useful only in dynamical systems in higher dimensions, is treated here. The intuition gained in one-dimension is invaluable though before moving on to higher-dimensional examples. Sarkovskii's theorem, which states that a one-dimensional dynamical system with a period three periodic orbit has periodic orbits for all other periods, is proved in detail. In addition, the Schwarzian derivative, so important in complex dynamics, is defined here.

This book is an introduction to dynamical systems defined by iterative maps of continuous functions. It doesn't require much advanced knowledge, but it does require a familiarity and certain level of comfort with proofs. The basic idea of this book is to explore (in the context of iterative maps) the major themes of dynamical systems, which can later be explored in the messier setting of differential equations and continuous-time systems. While this book doesn't discuss differential equations directly, the techniques used here can be transferred (with considerable work and thought) to that setting. Someone wanting an elementary book covering differential equations as dynamical systems might want to check out the excellent multi-volume work by J. Hubbard; the combination of that work with this book would provide the background to tackle the tougher and less-accessible texts dealing with chaotic systems of differential equations.Although this is a pure math book, the book does mention key applications and motivation behind the material; applied mathematicians will find this book quite useful, not necessarily because of the choice of topics but just because it greatly helps develop ones' intuition. The material is presented in a way that gives the student a sense of the big picture--what the theorems mean, how they fit together. Proofs are rigorous but as easy to follow as I have seen them in this subject.The choice and order of subjects is also both practical and fun. The book begins with 1-dimensional systems and explores just about everything interesting that happens with them (including Sarkovski's Theorem, one of the most bizarre and surprising mathematical results), before moving into two-dimensions and then dynamics in the complex plane.The bottom line?

An Introduction to Chaotic Dynamical Systems, 2nd Edition A First Course In Chaotic Dynamical

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