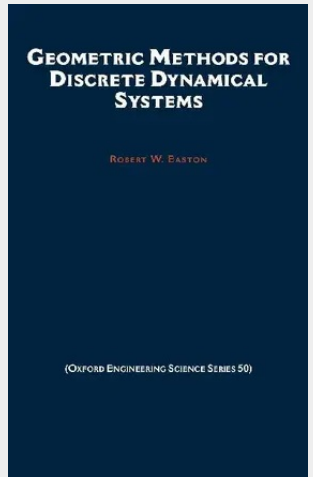


Geometric Methods for Discrete Dynamical Systems

This book is for those interested in dynamical systems. It assumes a solid undergraduate training in mathematics. Geometrical methods are developed to study the process of iteration, which involves taking the output of a function and feeding it back as input. Iteration processes are used to produce fractals and wavelets, and to numerically approximate solutions to ordinary and partial differential equations. Each iteration procedure generates a discrete dynamical system. These systems are at the heart of many numerical algorithms. Essentially all mathematical models of evolving physical systems can be viewed as discrete dynamical systems. This book attempts to present the fundamental ideas of discrete dynamical systems as clearly and geometrically as possible. Illustrative examples of dynamical systems are presented in the first chapter. The second chapter gives a review of the typology of metric spaces. The third presents basic results and establishes a philosophy of dynamics which is strongly influenced by the work of Charles Conley. The stable manifold and local structural stability theorems are presented in the fourth chapter. Invariant sets and isolating blocks are defined in the fifth. The sixth develops what is called the Conley Index in the context of discrete dynamics, and the final chapter covers measure-preserving and symplectic maps. The book would be suitable for use as a main text for a graduate course in dynamical systems, and as a reference for engineers and scientists.

This book looks at dynamics as an iteration process where the output of a function is fed back as an input to determine the evolution of an initial state over time. The theory examines errors which arise from round-off in numerical simulations, from the inexactness of mathematical models used to describe physical processes, and from the effects of external controls. The author provides an introduction accessible to beginning graduate students and emphasizing geometric aspects of the theory. Conley's ideas about rough orbits and chain-recurrence play a central role in the treatment. The book will be a useful reference for mathematicians, scientists, and engineers studying this field, and an ideal text for graduate courses in dynamical systems.



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