Most introductory texts in dynamical systems concern somewhat limited systems, such as homeomorphisms of the interval, or only particular techniques, such as symbolic dynamics or simulation of bifurcation. The book under review is an introduction to differentiable dynamical systems and all that is connected to their analysis. Thus it must include thorough treatments of topological dynamics, symbolic dynamics, and ergodic theory.

In order to begin a comprehensive exposition without sacrificing motivation, the authors use examples interlaced with definitions and propositions in the first chapter. Later chapters are organized by topic, providing easier reference and some independence among chapters.

This book emphasizes topological, measure-theoretic, and number-theoretic invariants associated to dynamical systems, and methods for deciding a system’s asymptotic behavior, including many local-to-global results.

The motivation is evident throughout the book. For example, the third chapter, on principal classes of asymptotic topological invariants, begins: “In this chapter we will embark upon the task of systematically identifying important specific phenomena associated with the asymptotic behavior of smooth dynamical systems. We will build upon the results of our survey of specific examples in Chapter 1 as well as on the insights gained from the general structural approach outlined and illustrated in Chapter 2.”

The (over 650 pages of) text is supplemented with a discussion of nonuniformly hyperbolic systems by Katok and L. Mendoza, with an appendix providing background material, with historical notes, and with hints and answers to exercises.

The audience for this book consists of graduate students or researchers in mathematics or related fields who have the “first year” background in measure theory, functional analysis, topology (with some differential geometry), and algebra, or are willing to learn it quickly from the appendix. The book is a pleasure to read.  

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