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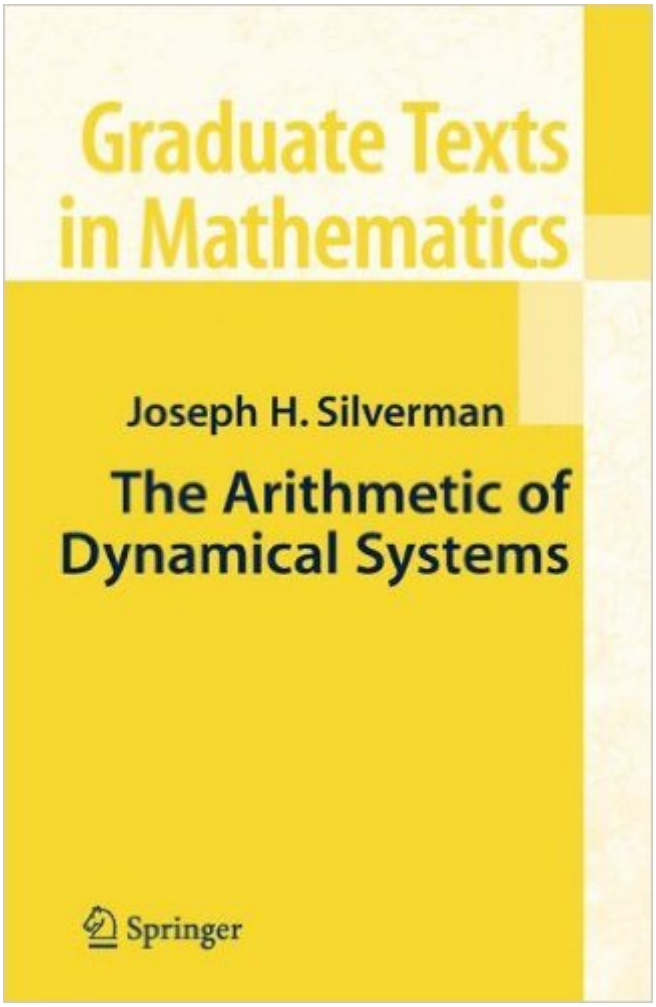
The Arithmetic Of Dynamical Systems (Graduate Texts In Mathematics)



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Synopsis

This book provides an introduction to the relatively new discipline of arithmetic dynamics. Whereas classical discrete dynamics is the study of iteration of self-maps of the complex plane or real line, arithmetic dynamics is the study of the number-theoretic properties of rational and algebraic points under repeated application of a polynomial or rational function. A principal theme of arithmetic dynamics is that many of the fundamental problems in the theory of Diophantine equations have dynamical analogs.This graduate-level text provides an entry for students into an active field of research and serves as a standard reference for researchers.

Book Information

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Customer Reviews

The topic of dynamical systems means different things depending on whether you are an in the field of engineering, mathematics, or physics. Engineers will tend to think of it as essentially Newtonian mechanics, whereas physicists will view it as a study of physical systems that are chaotic. Mathematicians have traditionally considered it to be a branch of differential geometry or global analysis. In recent decades however, the mathematical study of dynamical systems has been done in the context of algebraic geometry and number theory. This book elucidates some of this research, and although not entirely self-contained since many of the proofs are left to the references, it does introduce the reader to many of the ideas that have been put forward to study the "arithmetic" of dynamical systems.In the usual study of dynamical systems, notions of

complexity, such as Lyapunov exponents, topological entropy, basins of attraction, and strange attractors appear, as do constructions such as the invariant set, the Fatou and Julia sets, symbolic dynamics, and fixed periodic, and critical points. But in the arithmetic theory of dynamical systems, it is the `height' that plays the essential role as a measure of complexity. The theory of heights should be well known to those readers who come to the book with a strong background in algebraic number theory. But even if that is not the case the author does not make use of the general theory of arithmetic heights as outlined by the mathematician Andre Weil and discussed in detail in one of the author's earlier books on Diophantine geometry. The height is a measure of "arithmetic" complexity, and in the context of dynamical systems it is of natural interest to study how the height of a point varies under the iteration of a polynomial or rational map.

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