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| Nota di contenuto       | Cover; Contents; I: Introducing Discrete Dynamical Systems; 0 Opening Remarks; 0.1 Chaos; 0.2 Fractals; 0.3 The Character of Chaos and Fractals; 1 Functions; 1.1 Functions as Actions; 1.2 Functions as a Formula; 1.3 Functions are Deterministic; 1.4 Functions as Graphs; 1.5 Functions as Maps; Exercises; 2 Iterating Functions; 2.1 The Idea of Iteration; 2.2 Some Vocabulary and Notation; 2.3 Iterated Function Notation; 2.4 Algebraic Expressions for Iterated Functions; 2.5 Why Iteration?; Exercises; 3 Qualitative Dynamics: The Fate of the Orbit; 3.1 Dynamical Systems<br>3.2 Dynamics of the Squaring Function<br>3.3 The Phase Line; 3.4 Fixed Points via Algebra; 3.5 Fixed Points Graphically; 3.6 Types of Fixed Points; Exercises; 4 Time Series Plots; 4.1 Examples of Time Series Plots; Exercises; 5 Graphical Iteration; 5.1 An Initial Example; 5.2 The Method of Graphical Iteration; 5.3 Further Examples; Exercises; 6 Iterating Linear Functions; 6.1 A Series of Examples; 6.2 Slopes of +1 or -1; Exercises; 7 Population Models; 7.1 Exponential Growth; 7.2 Modifying the Exponential Growth Model; 7.3 The Logistic Equation; 7.4 A Note on the Importance of Stability<br>7.5 Other r Values<br>Exercises; 8 Newton, Laplace, and Determinism; 8.1 Newton and Universal Mechanics; 8.2 The Enlightenment and Optimism; 8.3 Causality and Laplace's Demon; 8.4 Science Today; 8.5 A |

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10.6 Chaotic Numerics: The Shadowing Lemma Exercises; 11 The Bifurcation Diagram; 11.1 A Collection of Final-State Diagrams; 11.2 Periodic Windows; 11.3 Bifurcation Diagram Summary; Exercises; 12 Universality; 12.1 Bifurcation Diagrams for Other Functions; 12.2 Universality of Period Doubling; 12.3 Physical Consequences of Universality; 12.4 Renormalization and Universality; 12.5 How are Higher-Dimensional Phenomena Universal?; Exercises; 13 Statistical Stability of Chaos; 13.1 Histograms of Periodic Orbits; 13.2 Histograms of Chaotic Orbits; 13.3 Ergodicity; 13.4 Predictable Unpredictability  
16.6 Fractals, Defined Again

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Sommario/riassunto

This book provides the reader with an elementary introduction to chaos and fractals, suitable for students with a background in elementary algebra, without assuming prior coursework in calculus or physics. It introduces the key phenomena of chaos - aperiodicity, sensitive dependence on initial conditions, bifurcations - via simple iterated functions. Fractals are introduced as self-similar geometric objects and analyzed with the self-similarity and box-counting dimensions. After a brief discussion of power laws, subsequent chapters explore Julia Sets and the Mandelbrot Set. The last part of the

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