Ebook free Nonlinear differential equations and dynamical systems universitext [PDF]

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system it is written for advanced undergraduates and for beginning graduate students it begins with a study of linear systems of ordinary differential equations a topic already familiar to the student who has completed a first course in differential equations syllabus this course is an introduction to differential equations and dynamical systems among the subjects to be treated 1 existence uniqueness theory for differential equations local and global existence differential equation as a dynamical system 2 general theory of linear differential equations floquet theory the focus of dynamical systems is to understand the qualitative behavior of the solutions typical questions include what are the equilbrium or time periodic solutions are these solutions stable what is the long time asymptotic behavior of general solutions do solutions be have chaotically a dynamical system is a system whose state is uniquely specified by a set of variables and whose behavior is described by predefined rules examples of dynamical systems include population growth a swinging pendulum the motions of celestial bodies and the behavior of rational individuals playing a negotiation game to name a few dynamical systems are mathematical models of how things change with time the time evolution is deterministic in the sense that there is some law of motion often a differential equation that determines future states from the present state of the system in this appendix we briefly discuss how a particular type of such equations namely reaction diffusion systems defines infinite dimensional dynamical systems the concentrations c i x t satisfy the problem dependent boundary conditions this textbook presents a systematic study of the qualitative and geometric theory of nonlinear differential equations and dynamical systems although the main topic of the book is the local and global behavior of nonlinear systems and their bifurcations a thorough treatment of linear systems is given at the beginning of the text

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we introduce the concept of a dynamical system and review the basic results and the terminology of the qualitative theory of differential and difference equations and vector fields we present the concept of stability of a fixed point of differential and difference equations

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equations with emphasis on the dynamical systems point of view how ever it also covers some classical topics such as di erential equations in the complex plane and boundary value strum liouville problems it only requires some basic knowledge from calculus complex functions and linear algebra which should be covered in the usual courses

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chapter 7 planar dynamical systems the proof of the poincar e bendixson theorem follows palis and de melo 33 more on ecological models can be found in hofbauer and sigmund 19 hirsch smale and devaney 18 and robinson 36 also cover these topics nicely

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the focus of dynamical systems is to understand the qualitative behavior of the solutions typical questions include what are the equilbrium or time periodic solutions are these solutions stable what is the long time asymptotic behavior of general solutions do solutions be have chaotically

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a dynamical system is a system whose state is uniquely specified by a set of variables and whose behavior is described by predefined rules examples of dynamical systems include population growth a swinging pendulum the motions of celestial bodies and the behavior of rational individuals playing a negotiation game to name a few

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dynamical systems are mathematical models of how things change with time the time evolution is deterministic in the sense that there is some law of motion often a differential equation that determines future states from the present state of the system

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