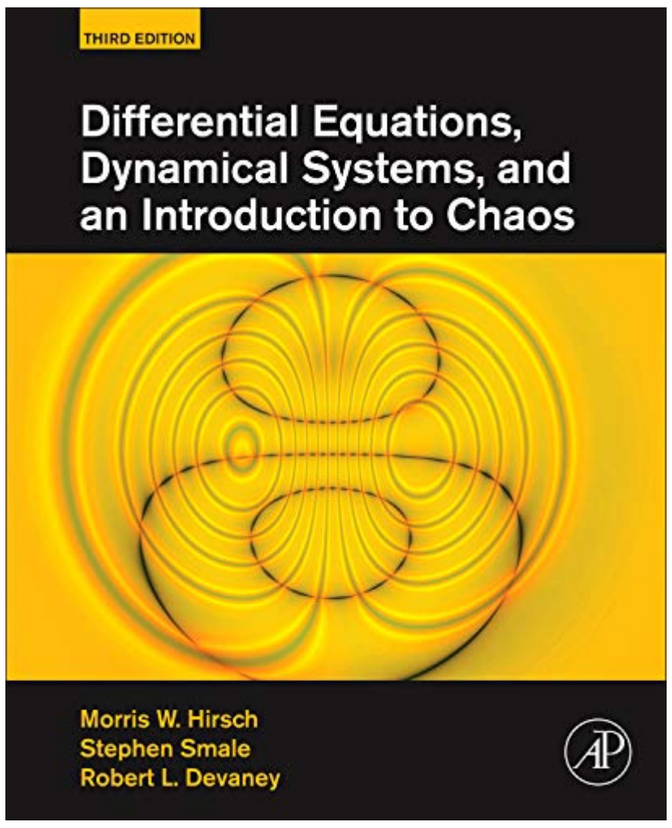

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Differential Equations, Dynamical Systems, and Linear Algebra-Morris W. Hirsch 1974-06-28 This book is about dynamical aspects of ordinary differential equations and the relations between dynamical systems and certain fields outside pure mathematics. A prominent role is played by the structure theory of linear operators on finite-dimensional vector spaces; the authors have included a self-contained treatment of that subject.

Differential Equations and Dynamical Systems-Lawrence Perko 2012-12-06 Mathematics is playing an ever more important role in the physical and biological sciences, provoking a blurring of boundaries between scientific disciplines and a resurgence bf interest in the modern as well as the clas sical techniques of applied mathematics. This renewal of interest, both in research and teaching, has led to the establishment of the series: Texts in Applied Mat!!ematics (TAM). The development of new courses is a natural consequence of a high level of excitement oil the research frontier as newer techniques, such as numerical and symbolic cotnputer systems, dynamical systems, and chaos, mix with and reinforce the traditional methods of applied mathematics. Thus, the purpose of this textbook series is to meet the current and future needs of these advances and encourage the teaching of new courses. TAM will publish textbooks suitable for use in advanced undergraduate and beginning graduate courses, and will complement the Applied Math ematical Sciences (AMS) series, which will focus on advanced textbooks and research level monographs. Preface to the Second Edition This book covers those topics necessary for a clear understanding of the qualitative theory of ordinary differential equations and the concept of a dynamical 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.

Differential Equations, Dynamical Systems, and an Introduction to Chaos-Morris W. Hirsch 2004 This text is about the dynamical aspects of ordinary differential equations and the relations between dynamical systems and certain fields outside pure mathematics. It is an update of one of Academic Press's most successful mathematics texts ever published, which has become the standard textbook for graduate courses in this area. The authors are tops in the field of advanced mathematics. Steve Smale is a Field's Medalist, which equates to being a Nobel prize winner in mathematics. Bob Devaney has authored several leading books in this subject area. Linear algebra prerequisites toned down from first edition Inclusion of analysis of examples of chaotic systems, including Lorenz, Rosssler, and Shilnikov systems Bifurcation theory included throughout.

Differential Equations-K.D. Elworthy 2017-11-22 Presents recent developments in the areas of differential equations, dynamical systems, and control of finke and infinite dimensional systems. Focuses on current trends in differential equations and dynamical system research-from Darameterdependence of solutions to robui control laws for inflnite dimensional systems.

Ordinary Differential Equations and Dynamical Systems-Gerald Teschl 2012-08-30 This book provides a self-contained introduction to ordinary differential equations and dynamical systems suitable for beginning graduate students. The first part begins with some simple examples of explicitly solvable equations and a first glance at qualitative methods. Then the fundamental results concerning the initial value problem are proved: existence, uniqueness, extensibility, dependence on initial conditions. Furthermore, linear equations are considered, including the Floquet theorem, and some perturbation results. As somewhat independent topics, the Frobenius method for linear equations in the complex domain is established and Sturm-Liouville boundary value problems, including oscillation theory, are investigated. The second part introduces the concept of a dynamical system. The Poincare-Bendixson theorem is proved, and several examples of planar systems from classical mechanics, ecology, and electrical engineering are investigated. Moreover, attractors, Hamiltonian systems, the KAM theorem, and periodic solutions are discussed. Finally, stability is studied, including the stable manifold and the Hartman-Grobman theorem for both continuous and discrete systems. The third part introduces chaos, beginning with the basics for iterated interval maps and ending with the Smale-Birkhoff theorem and the Melnikov method for homoclinic orbits. The text contains almost three hundred exercises. Additionally, the use of mathematical software systems is incorporated throughout, showing how they can help in the study of differential equations.

Nonlinear Differential Equations and Dynamical Systems-Ferdinand Verhulst 2012-12-06 For lecture courses that cover the classical theory of nonlinear differential equations associated with Poincare and Lyapunov and introduce the student to the ideas of bifurcation theory and chaos, this text is ideal. Its excellent pedagogical style typically consists of an insightful overview followed by theorems, illustrative examples, and exercises.

Differential Equations, Dynamical Systems, and an Introduction to Chaos-Morris W. Hirsch 2013 Hirsch, Devaney, and Smale's classic Differential Equations, Dynamical Systems, and an Introduction to Chaos has been used by professors as the primary text for undergraduate and graduate level courses covering differential equations. It provides a theoretical approach to dynamical systems and chaos written for a diverse student population among the fields of mathematics, science, and engineering. Prominent experts provide everything students need to know about dynamical systems as students seek to develop sufficient mathematical skills to analyze the types of differential equations that arise in their area of study. The authors provide rigorous exercises and examples clearly and easily by slowly introducing linear systems of differential equations. Calculus is required as specialized advanced topics not usually found in elementary differential equations courses are included, such as exploring the world of discrete dynamical systems and describing chaotic systems. Classic text by three of the world's most prominent mathematicians Continues the tradition of expository excellence Contains updated material and expanded applications for use in applied studies

Introduction to Differential Equations with Dynamical Systems-Stephen L. Campbell 2011-10-14 Many textbooks on differential equations are written to be interesting to the teacher rather than the student. Introduction to Differential Equations with Dynamical Systems is directed toward students. This concise and up-to-date textbook addresses the challenges that undergraduate mathematics, engineering, and science students experience during a first course on differential equations. And, while covering all the standard parts of the subject, the book emphasizes linear constant coefficient equations and applications, including the topics essential to engineering students. Stephen Campbell and Richard Haberman--using carefully worded derivations, elementary explanations, and examples, exercises, and figures rather than theorems and proofs--have written a book that makes learning and teaching differential equations easier and more relevant. The book also presents elementary dynamical systems in a unique and flexible way that is suitable for all courses, regardless of length.

Ordinary Differential Equations and Dynamical Systems-Thomas C. Sideris 2013-10-17 This book is a mathematically rigorous introduction to the beautiful subject of ordinary differential equations for beginning graduate or advanced undergraduate students. Students should have a solid background in analysis and linear algebra. The presentation emphasizes commonly used techniques without necessarily striving for completeness or for the treatment of a large number of topics. The first half of the book is devoted to the development of the basic theory: linear systems, existence and uniqueness of solutions to the initial value problem, flows, stability, and smooth dependence of solutions upon initial conditions and parameters. Much of this theory also serves as the paradigm for evolutionary partial differential equations. The second half of the book is devoted to geometric theory: topological conjugacy, invariant manifolds, existence and stability of periodic solutions, bifurcations, normal forms, and the existence of transverse homoclinic points and their link to chaotic dynamics. A common thread throughout the second part is the use of the implicit function theorem in Banach space. Chapter 5, devoted to this topic, the serves as the bridge between the two halves of the book.

Differential Equations and Dynamical Systems-Lawrence Perko 2013-11-21 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. All the material necessary for a clear understanding of the qualitative behavior of dynamical systems is contained in this textbook, including an outline of the proof and examples illustrating the proof of the Hartman-Grobman theorem. In addition to minor corrections and updates throughout, this new edition includes materials on higher order Melnikov theory and the bifurcation of limit cycles for planar systems of differential equations.

Differential Dynamical Systems-James D. Meiss 2007-01-01 Differential equations are the basis for models of any physical systems that exhibit smooth change. This book combines much of the material found in a traditional course on ordinary differential equations with an introduction to the more modern theory of dynamical systems. Applications of this theory to physics, biology, chemistry, and engineering are shown through examples in such areas as population modeling, fluid dynamics, electronics, and mechanics.Differential Dynamical Systems begins with coverage of linear systems, including matrix algebra; the focus then shifts to foundational material on nonlinear differential equations, making heavy use of the contraction-mapping theorem. Subsequent chapters deal specifically with dynamical systems conceptsflow, stability, invariant manifolds, the phase plane, bifurcation, chaos, and Hamiltonian dynamics. Throughout the book, the author includes exercises to help students develop an analytical and geometrical understanding of dynamics. Many of the exercises and examples are based on applications and some involve computation; an appendix offers simple codes written in Maple, Mathematica, and MATLAB software to give students practice with computation applied to dynamical systems problems. Audience This textbook is intended for senior undergraduates and first-year graduate students in pure and applied mathematics, engineering, and the physical sciences. Readers should be comfortable with elementary differential equations and linear algebra and should have had exposure to advanced calculus. Contents List of Figures; Preface; Acknowledgments; Chapter 1: Introduction; Chapter 2: Linear Systems; Chapter 3: Existence and Uniqueness; Chapter 4: Dynamical Systems; Chapter 5: Invariant Manifolds; Chapter 6: The Phase Plane; Chapter 7: Chaotic Dynamics; Chapter 8: Bifurcation Theory; Chapter 9: Hamiltonian Dynamics; Appendix: Mathematical Software; Bibliography; Index

Dynamical Systems-D. Arrowsmith 1992-08-01 This text discusses the qualitative properties of dynamical systems including both differential equations and maps. The approach taken relies heavily on examples (supported by extensive exercises, hints to solutions and diagrams) to develop the material, including a treatment of chaotic behavior. The unprecedented popular interest shown in recent years in the chaotic behavior of discrete dynamic systems including such topics as chaos and fractals has had its impact on the undergraduate and graduate curriculum. However there has, until now, been no text which sets out this developing area of mathematics within the context of standard teaching of ordinary differential equations. Applications in physics, engineering, and geology are considered and introductions to fractal imaging and cellular automata are given.

Differential Equations, Dynamical Systems, and an Introduction to Chaos-Morris W. Hirsch 2013 "Hirsch, Devaney, and Smale's classic Differential Equations, Dynamical Systems, and an Introduction to Chaos has been used by professors as the primary text for undergraduate and graduate level courses covering differential equations. It provides a theoretical approach to dynamical systems and chaos written for a diverse student population among the fields of mathematics, science, and engineering. Prominent experts provide everything students need to know about dynamical systems as students seek to develop sufficient mathematical skills to analyze the types of differential equations that arise in their area of study. The authors provide rigorous exercises and examples clearly and easily by slowly introducing linear systems of differential equations. Calculus is required as specialized advanced topics not usually found in elementary differential equations courses are included, such as exploring the world of discrete dynamical systems and describing chaotic systems. Classic text by three of the world's most prominent mathematicians. Continues the tradition of expository excellence. Contains updated material and expanded applications for use in applied studies."--Publisher's description.

Differential Equations, Dynamical Systems, and an Introduction to Chaos-Morris W. Hirsch 2004 This text is about the dynamical aspects of ordinary differential equations and the relations between dynamical systems and certain fields outside pure mathematics. It is an update of one of Academic Press's most successful mathematics texts ever published, which has become the standard textbook for graduate courses in this area. The authors are tops in the field of advanced mathematics. Steve Smale is a Field's Medalist, which equates to being a Nobel prize winner in mathematics. Bob Devaney has authored several leading books in this subject area. Linear algebra prerequisites toned down from first edition Inclusion of analysis of examples of chaotic systems, including Lorenz, Rosssler, and Shilnikov systems Bifurcation theory included throughout.

Exam Prep for: Differential Equations, Dynamical Systems, ...-

Differential Equations and Dynamical Systems-Abdulla Azamov 2018-10-20 This book features papers presented during a special session on dynamical systems, mathematical physics, and partial differential equations. Research articles are devoted to broad complex systems and models such as qualitative theory of dynamical systems, theory of games, circle diffeomorphisms, piecewise smooth circle maps, nonlinear parabolic systems, quadtratic dynamical systems, billiards, and intermittent maps. Focusing on a variety of topics from dynamical properties to stochastic properties of dynamical systems, this volume includes discussion on discrete-numerical tracking, conjugation between two critical circle maps, invariance principles, and the central limit theorem. Applications to game theory and networks are also included. Graduate students and researchers interested in complex systems, differential equations, dynamical systems, functional analysis, and mathematical physics will find this book useful for their studies. The special session was part of the second USA-Uzbekistan Conference on Analysis and Mathematical Physics held on August 8-12, 2017 at Urgench State University (Uzbekistan). The conference encouraged communication and future collaboration among U.S. mathematicians and their counterparts in Uzbekistan and other countries. Main themes included algebra and functional analysis, dynamical systems, mathematical physics and partial differential equations, probability theory and mathematical statistics, and pluripotential theory. A number of significant, recently established results were disseminated at the conference’s scheduled plenary talks, while invited talks presented a broad spectrum of findings in several sessions. Based on a different session from the conference, Algebra, Complex Analysis, and Pluripotential Theory is also published in the Springer Proceedings in Mathematics & Statistics Series.

Non-Linear Differential Equations and Dynamical Systems-Luis Manuel Braga da Costa Campos 2019-11-05 Non-Linear Differential Equations and Dynamical Systems is the second book within Ordinary Differential Equations with Applications to Trajectories and Vibrations, Six-volume Set. As a set, they are the fourth volume in the series Mathematics and Physics Applied to Science and Technology. This second book consists of two chapters (chapters 3 and 4 of the set). The first chapter considers non-linear differential equations of first order, including variable coefficients. A first-order differential equation is equivalent to a first-order differential in two variables. The differentials of order higher than the first and with more than two variables are also considered. The applications include the representation of vector fields by potentials. The second chapter in the book starts with linear oscillators with coefficients varying with time, including parametric resonance. It proceeds to non-linear oscillators including non-linear resonance, amplitude jumps, and hysteresis. The non-linear restoring and friction forces also apply to electromechanical dynamos. These are examples of dynamical systems with bifurcations that may lead to chaotic motions. Presents general first-order differential equations including non-linear like the Ricatti equation Discusses differentials of the first or higher order in two or more variables Includes discretization of differential equations as finite difference equations Describes parametric resonance of linear time dependent oscillators specified by the Mathieu functions and other methods Examines non-linear oscillations and damping of dynamical systems including bifurcations and chaotic motions

Differential Equations: A Dynamical Systems Approach-John H. Hubbard 1997-10-17 This corrected third printing retains the authors'main emphasis on ordinary differential equations. It is most appropriate for upper level undergraduate and graduate students in the fields of mathematics, engineering, and applied mathematics, as well as the life sciences, physics and economics. The authors have taken the view that a differential equations

theory defines functions; the object of the theory is to understand the behaviour of these functions. The tools the authors use include qualitative and numerical methods besides the traditional analytic methods, and the companion software, MacMath, is designed to bring these notions to life.

Ordinary Differential Equations-Virginia W. Noonburg 2014 The essential tools for analysing ordinary differential equations that undergraduate students in engineering and the applied sciences need to learn.

Dynamical Systems-Shlomo Sternberg 2014-06-10 A pioneer in the field of dynamical systems discusses one-dimensional dynamics, differential equations, random walks, iterated function systems, symbolic dynamics, and Markov chains. Supplementary materials include PowerPoint slides and MATLAB exercises. 2010 edition.

Topology, Ordinary Differential Equations, Dynamical Systems-Matematicheskiĭ institut im. V.A. Steklova 1986

Differential Equations-A. C. King 2003-05-08 For students taking second courses; the subject is central and required at second year and above.

Dynamical Systems-Lamberto Cesari 2014-05-10 Dynamical Systems: An International Symposium, Volume 1 contains the proceedings of the International Symposium on Dynamical Systemsheld at Brown University in Providence, Rhode Island, on August 12-16, 1974. The symposium provided a forum for reviewing the theory of dynamical systems in relation to ordinary and functional differential equations, as well as the influence of this approach and the techniques of ordinary differential equations on research concerning certain types of partial differential equations and evolutionary equations in general. Comprised of 29 chapters, this volume begins with an introduction to some aspects of the qualitative theory of differential equations, followed by a discussion on the Lefschetz fixed-point formula. Nonlinear oscillations in the frame of alternative methods are then examined, along with topology and nonlinear boundary value problems. Subsequent chapters focus on bifurcation theory; evolution governed by accretive operators; topological dynamics and its relation to integral equations and non-autonomous systems; and non-controllability of linear time-invariant systems using multiple one-dimensional linear delay feedbacks. The book concludes with a description of sufficient conditions for a relaxed optimal control problem. This monograph will be of interest to students and practitioners in the field of applied mathematics.

Dynamical Systems I-S.Kh. Aranson 1996-12-18 From the reviews: "The reading is very easy and pleasant for the non-mathematician, which is really noteworthy. The two chapters enunciate the basic principles of the field, ... indicate connections with other fields of mathematics and sketch the motivation behind the various concepts which are introduced.... What is particularly pleasant is the fact that the authors are quite successful in giving to the reader the feeling behind the demonstrations which are sketched. Another point to notice is the existence of an annotated extended bibliography and a very complete index. This really enhances the value of this book and puts it at the level of a particularly interesting reference tool. I thus strongly recommend to buy this very interesting and stimulating book." Journal de Physique

Ordinary Differential Equations-A. K. Nandakumaran 2017-05-11 An easy to understand guide covering key principles of ordinary differential equations and their applications.

Nonlinear PDEs: A Dynamical Systems Approach- Guido Schneider 2017-10-26 This is an introductory textbook about nonlinear dynamics of PDEs, with a focus on problems over unbounded domains and modulation equations. The presentation is example-oriented, and new mathematical tools are developed step by step, giving insight into some important classes of nonlinear PDEs and nonlinear dynamics phenomena which may occur in PDEs. The book consists of four parts. Parts I and II are introductions to finite- and infinite-dimensional dynamics defined by ODEs and by PDEs over bounded domains, respectively, including the basics of bifurcation and attractor theory. Part III introduces PDEs on the real line, including the Korteweg-de Vries equation, the Nonlinear Schrödinger equation and the Ginzburg-Landau equation. These examples often occur as simplest possible models, namely as amplitude or modulation equations, for some real world phenomena such as nonlinear waves and pattern formation. Part IV explores in more detail the connections between such complicated physical systems and the reduced models. For many models, a mathematically rigorous justification by approximation results is given. The parts of the book are kept as self-contained as possible. The book is suitable for self-study, and there are various possibilities to build one- or two-semester courses from the book.

Differential Equations: From Calculus to Dynamical Systems: Second Edition-Virginia W. Noonburg 2020-08-28 A thoroughly modern textbook for the sophomore-level differential equations course. The examples and exercises emphasize modeling not only in engineering and physics but also in applied mathematics and biology. There is an early introduction to numerical methods and, throughout, a strong emphasis on the qualitative viewpoint of dynamical systems. Bifurcations and analysis of parameter variation is a persistent theme. Presuming previous exposure to only two semesters of calculus, necessary linear algebra is developed as needed. The exposition is very clear and inviting. The book would serve well for use in a flipped-classroom pedagogical approach or for self-study for an advanced undergraduate or beginning graduate student. This second edition of Noonburg's best-selling textbook includes two new chapters on partial differential equations, making the book usable for a two-semester sequence in differential equations. It includes exercises, examples, and extensive student projects taken from the current mathematical and scientific literature.

Dynamical Systems- 1998-11-17 Several distinctive aspects make Dynamical Systems unique, including: treating the subject from a mathematical perspective with the proofs of most of the results included providing a careful review of background materials introducing ideas through examples and at a level accessible to a beginning graduate student

Discrete Dynamical Systems and Difference Equations with Mathematica-Mustafa R.S. Kulenovic 2002-02-27 Following the work of Yorke and Li in 1975, the theory of discrete dynamical systems and difference equations developed rapidly. The applications of difference equations also grew rapidly, especially with the introduction of graphical-interface software that can plot trajectories, calculate Lyapunov exponents, plot bifurcation diagrams, and find basins of attraction. Modern computer algebra systems have opened the door to the use of symbolic calculation for studying difference equations. This book offers an introduction to discrete dynamical systems and difference equations and presents the Dynamica software. Developed by the authors and based on Mathematica, Dynamica provides an easy-to-use collection of algebraic, numerical, and graphical tools and techniques that allow users to quickly gain the ability to: Find and classify the stability character of equilibrium and periodic points Perform semicycle analysis of solutions Calculate and visualize invariants Calculate and visualize Lyapunov functions and numbers Plot bifurcation diagrams Visualize stable and unstable manifolds Calculate Box Dimension While it presents the essential theoretical concepts and results, the book's emphasis is on using the software. The authors present two sets of Dynamica sessions: one that serves as a tutorial of the different techniques, the other features case studies of well-known difference equations. Dynamica and notebooks corresponding to particular chapters are available for download from the Internet.

A Practical Approach to Dynamical Systems for Engineers-Patricia Mellodge 2015-11-19 A Practical Approach to Dynamical Systems for Engineers takes the abstract mathematical concepts behind dynamical systems and applies them to real-world systems, such as a car traveling down the road, the ripples caused by throwing a pebble into a pond, and a clock pendulum swinging back and forth. Many relevant topics are covered, including modeling systems using differential equations, transfer functions, state-space representation, Hamiltonian systems, stability and equilibrium, and nonlinear system characteristics with examples including chaos, bifurcation, and limit cycles. In addition, MATLAB is used extensively to show how the analysis methods are applied to the examples. It is assumed readers will have an understanding of calculus, differential equations, linear algebra, and an interest in mechanical and electrical dynamical systems. Presents applications in engineering to show the adoption of dynamical system analytical methods Provides examples on the dynamics of automobiles, aircraft, and human balance, among others, with an emphasis on physical engineering systems MATLAB and Simulink are used throughout to apply the analysis methods and illustrate the ideas Offers in-depth discussions of every abstract concept, described in an intuitive manner, and illustrated using practical examples, bridging the gap between theory and practice Ideal resource for practicing engineers who need to understand background theory and how to apply it

Uncertain Dynamical Systems-A.A. Martynyuk 2011-11-28 This self-contained book provides systematic instructive analysis of uncertain systems of the following types: ordinary differential equations, impulsive equations, equations on time scales, singularly perturbed differential equations, and set differential equations. Each chapter contains new conditions of stability of unperturbed motion of the abo

Ordinary Differential Equations-Virginia W. Noonburg 2014-05-02 This book presents a modern treatment of material traditionally covered in the sophomore-level course in ordinary differential equations. While this course is usually required for engineering students the material is attractive to students in any field of applied science, including those in the biological sciences. The standard analytic methods for solving first and second-order differential equations are covered in the first three chapters. Numerical and graphical methods are considered, side-by-side with the analytic methods, and are then used throughout the text. An early emphasis on the graphical treatment of autonomous first-order equations leads easily into a discussion of bifurcation of solutions with respect to parameters. The fourth chapter begins the study of linear systems of first-order equations and includes a section containing all of the material on matrix algebra needed in the remainder of the text. Building on the linear analysis, the fifth chapter brings the student to a level where two-dimensional nonlinear systems can be analyzed graphically via the phase plane. The study of bifurcations is extended to systems of equations, using several compelling examples, many of which are drawn from population biology. In this chapter the student is gently introduced to some of the more important results in the theory of dynamical systems. A student project, involving a problem recently appearing in the mathematical literature on dynamical systems, is included at the end of Chapter 5. A full treatment of the Laplace transform is given in Chapter 6, with several of the examples taken from the biological sciences. An appendix contains completely worked-out solutions to all of the odd-numbered exercises. The book is aimed at students with a good calculus background that want to learn more about how calculus is used to solve real problems in today's world. It can be used as a text for the introductory differential equations course, and is readable enough to be used even if the class is being "flipped." The book is also accessible as a self-study text for anyone who has completed two terms of calculus, including highly motivated high school students. Graduate students preparing to take courses in dynamical systems theory will also find this text useful.

Difference Equations by Differential Equation Methods-Peter E. Hydon 2014-08-07 Most well-known solution techniques for differential equations exploit symmetry in some form. Systematic methods have been developed for finding and using symmetries, first integrals and conservation laws of a given differential equation. Here the author explains how to extend these powerful methods to difference equations, greatly increasing the range of solvable problems. Beginning with an introduction to elementary solution methods, the book gives readers a clear explanation of exact techniques for ordinary and partial difference equations. The informal presentation is suitable for anyone who is familiar with standard differential equation methods. No prior knowledge of difference equations or symmetry is assumed. The author uses worked examples to help readers grasp new concepts easily. There are 120 exercises of varying difficulty and suggestions for further reading. The book goes to the cutting edge of research; its many new ideas and methods make it a valuable reference for researchers in the field.

Topology, Ordinary Differential Equations, Dynamical Systems-Matematicheskiĭ institut im. V.A. Steklova 1986

An Introduction to Infinite-Dimensional Linear Systems Theory-Ruth F. Curtain 2012-12-06 Infinite dimensional systems is now an established area of research. Given the recent trend in systems theory and in applications towards a synthesis of time- and frequency-domain methods, there is a need for an introductory text which treats both state-space and frequency-domain aspects in an integrated fashion. The authors' primary aim is to write an introductory textbook for a course on infinite dimensional linear systems. An important consideration by the authors is that their book should be accessible to graduate engineers and mathematicians with a minimal background in functional analysis. Consequently, all the mathematical background is summarized in an extensive appendix. For the majority of students, this would be their only acquaintance with infinite dimensional systems.

Monotone Dynamical Systems-Hal L. Smith 2008 This book presents comprehensive treatment of a rapidly developing area with many potential applications: the theory of monotone dynamical systems and the theory of competitive and cooperative differential equations. The primary aim is to provide potential users of the theory with techniques, results, and ideas useful in applications, while at the same time providing rigorous proofs. Among the topics discussed in the book are continuous-time monotone dynamical systems, and quasimonotone and nonquasimonotone delay differential equations. The book closes with a discussion of applications to quasimonotone systems of reaction-diffusion type. Throughout the book, applications of the theory to many mathematical models arising in biology are discussed. Requiring a background in dynamical systems at the level of a first graduate course, this book is useful to graduate students and researchers working in the theory of dynamical systems and its applications.

Dynamical Systems with Applications Using Mathematica®-Stephen Lynch 2017-10-12 This book provides an introduction to the theory of dynamical systems with the aid of the Mathematica® computer algebra package. The book has a very hands-on approach and takes the reader from basic theory to recently published research material. Emphasized throughout are numerous applications to biology, chemical kinetics, economics, electronics, epidemiology, nonlinear optics, mechanics, population dynamics, and neural networks. Theorems and proofs are kept to a minimum. The first section deals with continuous systems using ordinary differential equations, while the second part is devoted to the study of discrete dynamical systems.

Data-Driven Science and Engineering-Steven L. Brunton 2019-02-28 This beginning graduate textbook teaches data science and machine learning methods for modeling, prediction, and control of complex systems.

Global Bifurcations and Chaos-Stephen Wiggins 2013-11-27 Global Bifurcations and Chaos: Analytical Methods is unique in the literature of chaos in that it not only defines the concept of chaos in deterministic systems, but it describes the mechanisms which give rise to chaos (i.e., homoclinic and heteroclinic motions) and derives explicit techniques whereby these mechanisms can be detected in specific systems. These techniques can be viewed as generalizations of Melnikov's method to multi-degree of freedom systems subject to slowly varying parameters and quasiperiodic excitations. A unique feature of the book is that each theorem is illustrated with drawings that enable the reader to build visual pictures of global dynamcis of the systems being described. This approach leads to an enhanced intuitive understanding of the theory.

Dispersive Partial Differential Equations-M. Burak Erdoğan 2016-05-03 The area of nonlinear dispersive partial differential equations (PDEs) is a fast developing field which has become exceedingly technical in recent years. With this book, the authors provide a self-contained and accessible introduction for graduate or advanced undergraduate students in mathematics, engineering, and the physical sciences. Both classical and modern methods used in the field are described in detail, concentrating on the model cases that simplify the presentation without compromising the deep technical aspects of the theory, thus allowing students to learn the material in a short period of time. This book is appropriate both for self-study by students with a background in analysis, and for teaching a semester-long introductory graduate course in nonlinear dispersive PDEs. Copious exercises are included, and applications of the theory are also presented to connect dispersive PDEs with the more general areas of dynamical systems and mathematical physics.