The Theory Of Differential Equations Classical And Qualitative

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WOODARD STOUT

The Theory of Differential Equations Academic Press
This book provides a comprehensive introduction to the theory of ordinary differential equations with a focus on mechanics and dynamical systems as important applications of the theory. The text is written to be used in the traditional way or in a more applied way. The accompanying CD contains Maple worksheets for the exercises, and special Maple code for performing various tasks. In addition to its use in a traditional one or two semester graduate course in mathematics, the book is organized to be used for interdisciplinary courses in applied mathematics, physics, and engineering.
Introduction to the Theory of Linear Partial Differential Equations CRC Press
For over 300 years, differential equations have served as an essential tool for describing and analyzing problems in many scientific disciplines. This carefully-written textbook provides an introduction to many of the important topics associated with ordinary differential equations. Unlike most textbooks on the subject, this text includes nonstandard topics such as perturbation methods and differential equations and Mathematica. In addition to the nonstandard topics, this text also contains contemporary material in the area as well as its classical topics. This second edition is updated to be compatible with Mathematica, version 7.0. It also provides 81 additional exercises, a new section in Chapter 1 on the generalized logistic equation, an additional theorem in Chapter 2 concerning fundamental matrices, and many more other enhancements to the first edition. This book can be used either for a second course in ordinary differential equations or as an introductory course for well-prepared students. The prerequisites for this book are three semesters of calculus and a course in linear algebra, although the needed concepts from linear algebra are introduced along with examples in the book. An undergraduate course in analysis is needed for the more theoretical subjects covered in the final two chapters.
Differential Equations American Mathematical Soc.
The author, Professor Kurzweil, is one of the world's top experts in the area of ordinary differential equations - a fact fully reflected in this book. Unlike many classical texts which concentrate primarily on methods of integration of differential equations, this book pursues a modern approach: the topic is discussed in full generality which, at the same time, permits us to gain a deep insight into the theory and to develop a fruitful intuition. The basic framework of the theory is expanded by considering further important topics like stability, dependence of a solution on a parameter, Caratheodory's theory and differential relations. The book is very well written, and the prerequisites needed are minimal - some basics of analysis and linear algebra. As such, it is accessible to a wide circle of readers, in particular to non-mathematicians.
Differential Equations CUP Archive
This book provides a complete analysis of those subjects that are of fundamental importance to the qualitative theory of differential equations and related to current research-including details that other books in the field tend to overlook. Chapters 1-7 cover the basic qualitative properties concerning existence and uniqueness, structures of solutions, phase portraits, stability, bifurcation and chaos. Chapters 8-12 cover stability, dynamical systems, and bounded and periodic solutions. A good reference book for teachers, researchers, and other professionals.
Galois Theory of Linear Differential Equations Elsevier Publishing Company
This unusually well-written, skillfully organized introductory text provides an exhaustive survey of ordinary differential equations — equations which express the relationship between variables and their derivatives. In a disarmingly simple, step-by-step style that never sacrifices mathematical rigor, the authors — Morris Tenenbaum of Cornell University, and Harry Pollard of Purdue University — introduce and explain complex, critically-important concepts to undergraduate students of mathematics, engineering and the sciences. The book begins with a section that examines the origin of differential equations, defines basic terms and outlines the general solution of a differential equation-the solution that actually contains every solution of such an equation. Subsequent sections deal with such subjects as: integrating factors; dilution and accretion problems; the algebra of complex numbers; the linearization of first order systems; Laplace Transforms; Newton's Interpolation Formulas; and Picard's Method of Successive Approximations. The book contains two exceptional chapters: one on series methods of solving differential equations, the second on numerical methods of solving differential equations. The first includes a discussion of the Legendre Differential Equation, Legendre Functions, Legendre Polynomials, the Bessel Differential Equation, and the Laguerre Differential Equation. Throughout the book, every term is clearly defined and every theorem lucidly and thoroughly analyzed, and there is an admirable balance between the theory of differential equations and their application. An abundance of solved problems and practice exercises enhances the value of Ordinary Differential Equations as a classroom text for undergraduate

students and teaching professionals. The book concludes with an in-depth examination of existence and uniqueness theorems about a variety of differential equations, as well as an introduction to the theory of determinants and theorems about Wronskians.
Ordinary Differential Equations Springer Science & Business Media
Differential equations have a remarkable ability to predict the world around us. They are used in a wide variety of disciplines, from biology, economics, physics, chemistry and engineering. They can describe exponential growth and decay, the population growth of species or the change in investment return over time. A differential equation is a mathematical equation that relates some function with its derivatives. In applications, the functions usually represent physical quantities, the derivatives represent their rates of change, and the equation defines a relationship between the two. For over 300 years, differential equations have served as an essential tool for describing and analyzing problems in many scientific disciplines. Differential equations can be divided into several types. Apart from describing the properties of the equation itself, these classes of differential equations can help inform the choice of approach to a solution. Commonly used distinctions include whether the equation is: Ordinary/Partial, Linear/Non-linear, and Homogeneous/Inhomogeneous. The theory of differential equations is closely related to the theory of difference equations, in which the coordinates assume only discrete values, and the relationship involves values of the unknown function or functions and values at nearby coordinates. Many methods to compute numerical solutions of differential equations or study the properties of differential equations involve approximation of the solution of a differential equation by the solution of a corresponding difference equation.
Theory of Differential Equations John Wiley & Sons
Providing readers with the very basic knowledge necessary to begin research on differential equations with professional ability, the selection of topics here covers the methods and results that are applicable in a variety of different fields. The book is divided into four parts. The first covers fundamental existence, uniqueness, smoothness with respect to data, and nonuniqueness. The second part describes the basic results concerning linear differential equations, while the third deals with nonlinear equations. In the last part the authors write about the basic results concerning power series solutions. Each chapter begins with a brief discussion of its contents and history, and hints and comments for many problems are given throughout. With 114 illustrations and 206 exercises, the book is suitable for a one-year graduate course, as well as a reference book for research mathematicians.
Lectures On The Theory Of Group Properties Of Differential Equations Courier Corporation
Introduction to the Theory and Application of Differential Equations with Deviating Arguments 2nd edition is a revised and substantially expanded edition of the well-known book of L. E. El’sgol’ts published under this same title by Nauka in 1964. Extensions of the theory of differential equations with deviating argument as well as the stimuli of developments within various fields of science and technology contribute to the need for a new edition. This theory in recent years has attracted the attention of vast numbers of researchers, interested both in the theory and its applications. The development of the foundations of the theory of differential equations with a deviating argument is still far from complete. This situation, of course, leaves its mark on our suggestions to the reader of the book and prevents as orderly and systematic a presentation as is usual for mathematical literature. However, it is hoped that in spite of these deficiencies the book will prove useful as a first acquaintanceship with the theory of differential equations with a deviating argument.
Theory of Ordinary Differential Equations Springer Science & Business Media
These lecturers provide a clear introduction to Lie group methods for determining and using symmetries of differential equations, a variety of their applications in gas dynamics and other nonlinear models as well as the author's remarkable contribution to this classical subject. It contains material that is useful for students and teachers but cannot be found in modern texts. For example, the theory of partially invariant solutions developed by Ovsyannikov provides a powerful tool for solving systems of nonlinear differential equations and investigating complicated mathematical models.
Ordinary Differential Equations Springer Science & Business Media
Among the topics covered in this classic treatment are linear differential equations; solution in an infinite form; solution by definite integrals; algebraic theory; Sturmian theory and its later developments; further developments in the theory of boundary problems; existence theorems, equations of first order; nonlinear equations of higher order; more. "Highly recommended" — Electronics Industries.
The Theory of Differential Equations World Scientific Publishing Company
Since the first edition of this book, geometrical methods in the theory of ordinary differential equations have become very popular and some progress has been made partly with the help of computers. Much of this progress is represented in this revised, expanded edition, including such topics as the Feigenbaum universality of period doubling, the Zoladec solution, the Iljashenko proof, the Ecalle and Voronin theory, the Varchenko and Hovanski theorems, and the Neistadt theory. In the selection of material for this book, the author explains basic ideas and methods applicable to the study of differential equations. Special efforts were made to keep the basic ideas free from excessive technicalities. Thus the most fundamental questions are considered in great detail, while of the more special and difficult parts of the theory have the character of a survey. Consequently, the reader needs only a general mathematical knowledge to easily follow this text. It is directed to mathematicians, as well as all users of the theory of differential equations.
Ordinary Differential Equations Birkhäuser
Abstract semilinear functional differential equations arise from many biological, chemical, and physical systems which are characterized by both spatial and temporal variables and exhibit various spatio-temporal patterns. The aim of this book is to provide an introduction of the qualitative theory and applications of these equations from the dynamical systems point of view. The required prerequisites for that book are at a level of a graduate student. The style of presentation will be appealing to people trained and interested in qualitative theory of ordinary and functional differential equations.
Introduction to the Theory of Linear Differential Equations Springer Science & Business Media
This textbook provides a comprehensive introduction to the qualitative theory of ordinary differential equations. It includes a discussion of the existence and uniqueness of solutions, phase portraits,

linear equations, stability theory, hyperbolicity and equations in the plane. The emphasis is primarily on results and methods that allow one to analyze qualitative properties of the solutions without solving the equations explicitly. The text includes numerous examples that illustrate in detail the new concepts and results as well as exercises at the end of each chapter. The book is also intended to serve as a bridge to important topics that are often left out of a course on ordinary differential equations. In particular, it provides brief introductions to bifurcation theory, center manifolds, normal forms and Hamiltonian systems.
The Theory of Differential Equations Princeton University Press
For over 300 years, differential equations have served as an essential tool for describing and analyzing problems in many scientific disciplines. This carefully-written textbook provides an introduction to many of the important topics associated with ordinary differential equations. Unlike most textbooks on the subject, this text includes nonstandard topics such as perturbation methods and differential equations and Mathematica. In addition to the nonstandard topics, this text also contains contemporary material in the area as well as its classical topics. This second edition is updated to be compatible with Mathematica, version 7.0. It also provides 81 additional exercises, a new section in Chapter 1 on the generalized logistic equation, an additional theorem in Chapter 2 concerning fundamental matrices, and many more other enhancements to the first edition. This book can be used either for a second course in ordinary differential equations or as an introductory course for well-prepared students. The prerequisites for this book are three semesters of calculus and a course in linear algebra, although the needed concepts from linear algebra are introduced along with examples in the book. An undergraduate course in analysis is needed for the more theoretical subjects covered in the final two chapters.
Geometrical Methods in the Theory of Ordinary Differential Equations Springer Science & Business Media
Differential Equations: Techniques, Theory, and Applications is designed for a modern first course in differential equations either one or two semesters in length. The organization of the book interweaves the three components in the subtitle, with each building on and supporting the others. Techniques include not just computational methods for producing solutions to differential equations, but also qualitative methods for extracting conceptual information about differential equations and the systems modeled by them. Theory is developed as a means of organizing, understanding, and codifying general principles. Applications show the usefulness of the subject as a whole and heighten interest in both solution techniques and theory. Formal proofs are included in cases where they enhance core understanding; otherwise, they are replaced by informal justifications containing key ideas of a proof in a more conversational format. Applications are drawn from a wide variety of fields: those in physical science and engineering are prominent, of course, but models from biology, medicine, ecology, economics, and sports are also featured. The 1,400+ exercises are especially compelling. They range from routine calculations to large-scale projects. The more difficult problems, both theoretical and applied, are typically presented in manageable steps. The hundreds of meticulously detailed modeling problems were deliberately designed along pedagogical principles found especially effective in the MAA study Characteristics of Successful Calculus Programs, namely, that asking students to work problems that require them to grapple with concepts (or even proofs) and do modeling activities is key to successful student experiences and retention in STEM programs. The exposition itself is exceptionally readable, rigorous yet conversational. Students will find it inviting and approachable. The text supports many different styles of pedagogy from traditional lecture to a flipped classroom model. The availability of a computer algebra system is not assumed, but there are many opportunities to incorporate the use of one.
Introduction to the Theory of Linear Differential Equations Courier Dover Publications
Subriemannian geometries, also known as Carnot-Caratheodory geometries, can be viewed as limits of Riemannian geometries. They also arise in physical phenomenon involving ``geometric phases'' or holonomy. Very roughly speaking, a subriemannian geometry consists of a manifold endowed with a distribution (meaning a k-plane field, or subbundle of the tangent bundle), called horizontal together with an inner product on that distribution. If $k=n$, the dimension of the manifold, we get the usual Riemannian geometry. Given a subriemannian geometry, we can define the distance between two points just as in the Riemannian case, except we are only allowed to travel along the horizontal lines between two points. The book is devoted to the study of subriemannian geometries, their geodesics, and their applications. It starts with the simplest nontrivial example of a subriemannian geometry: the two-dimensional isoperimetric problem reformulated as a problem of finding subriemannian geodesics. Among topics discussed in other chapters of the first part of the book the author mentions an elementary exposition of Gromov's surprising idea to use subriemannian geometry for proving a theorem in discrete group theory and Cartan's method of equivalence applied to the problem of understanding invariants (diffeomorphism types) of distributions. There is also a chapter devoted to open problems. The second part of the book is devoted to applications of subriemannian geometry. In particular, the author describes in detail the following four physical problems: Berry's phase in quantum mechanics, the problem of a falling cat righting herself, that of a microorganism swimming, and a phase problem arising in the N-body problem. He shows that all these problems can be studied using the same underlying type of subriemannian geometry: that of a principal bundle endowed with G-invariant metrics. Reading the book requires introductory knowledge of differential geometry, and it can serve as a good introduction to this new, exciting area of mathematics. This book provides an introduction to and a comprehensive study of the qualitative theory of ordinary differential equations. It begins with fundamental theorems on existence, uniqueness, and initial conditions, and discusses basic principles in dynamical systems and Poincare-Bendixson theory. The authors present a careful analysis of solutions near critical points of linear and nonlinear planar systems and discuss indices of planar critical points. A very thorough study of limit cycles is given, including many results on quadratic systems and recent developments in China. Other topics included are: the critical point at infinity, harmonic solutions for periodic differential equations, systems of ordinary differential equations on the torus, and structural stability for systems on two-dimensional manifolds. This books is accessible to graduate students and advanced undergraduates and is also of interest to researchers in this area. Exercises are included at the end of each chapter.
Introduction to the Theory and Application of Differential Equations with Deviating Arguments Princeton University Press
This volume presents a systematic and mathematically rigorous exposition of methods for studying

linear partial differential equations. It focuses on quantization of the corresponding objects (states, observables and canonical transformations) in the phase space. The quantization of all three types of classical objects is carried out in a unified w

Ordinary Differential Equations Courier Corporation

Introduction to the Theory of Linear Partial Differential Equations

Differential Equations Springer Science & Business Media

This book has developed from courses given by the authors and probably contains more material than will ordinarily be covered in a one-year course. It is hoped that the book will be a useful text in the application of differential equations as well as for the pure mathematician. Prerequisite for this book is a knowledge of matrices and the essentials of functions in a complex variable. The book thoroughly addresses linear equations, and touches on the use of the Riemann-Stieltjes integral, and the Lebesgue integral, and the theorems required from integration theory. The problems, in some cases, give additional material not considered in the text.

Basic Theory of Ordinary Differential Equations CRC Press

Suitable for advanced undergraduates and graduate students, this was the first English-language text to offer detailed coverage of boundedness, stability, and asymptotic behavior of linear and nonlinear differential equations. It remains a classic guide, featuring material from original research papers, including the author's own studies. The linear equation with constant and almost-constant coefficients receives in-depth attention that includes aspects of matrix theory. No previous acquaintance with the theory is necessary, since author Richard Bellman derives the results in matrix theory from the beginning. In regard to the stability of nonlinear systems, results of the linear theory are used to drive the results of Poincaré and Liapounoff. Professor Bellman then surveys important results concerning the boundedness, stability, and asymptotic behavior of second-order linear differential equations. The final chapters explore significant nonlinear differential equations whose solutions may be completely described in terms of asymptotic behavior. Only real solutions of real equations are considered, and the treatment emphasizes the behavior of these solutions as the independent variable increases without limit.