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This book gives a mathematical treatment of the introduction to qualitative differential equations and discrete dynamical systems. The treatment includes theoretical proofs, methods of calculation, and applications. The two parts of the book, continuous time of differential equations and discrete time of dynamical systems, can be covered independently in one semester each or combined together into a year long course. The material on differential

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equations introduces the qualitative or geometric approach through a treatment of linear systems in any dimension. There follows chapters where equilibria are the most important feature, where scalar (energy) functions is the principal tool, where periodic orbits appear, and finally, chaotic systems of differential equations. The many different approaches are systematically introduced through examples and theorems. The material on discrete dynamical systems starts with maps of one variable and proceeds to systems in higher dimensions. The treatment starts with examples where the periodic points can be found explicitly and then introduces symbolic dynamics to analyze where they can be shown to exist but not given in explicit form. Chaotic systems are presented both mathematically and

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more computationally using Lyapunov exponents. With the one-dimensional maps as models, the multidimensional maps cover the same material in higher dimensions. This higher dimensional material is less computational and more conceptual and theoretical. The final chapter on fractals introduces various dimensions which is another computational tool for measuring the complexity of a system. It also treats iterated function systems which give examples of complicated sets. In the second edition of the book, much of the material has been rewritten to clarify the presentation. Also, some new material has been included in both parts of the book. This book can be used as a textbook for an advanced undergraduate course on ordinary differential equations and/or dynamical systems.

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Prerequisites are standard courses in calculus (single variable and multivariable), linear algebra, and introductory differential equations.

Written for beginners, this well organized introduction promotes a solid understanding of differential equations that is flexible enough to meet the needs of many different disciplines. With less emphasis on formal calculation than found in other books all the basic methods are covered—first order equations, separation, exact form, and linear equations—as well as higher order cases, linear equation with constant and variable coefficients, Laplace transform methods, and boundary value problems. The book's systems focus induces an intuitive understanding of the concept of a solution of an initial value problem in order

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to resolve potential confusion about what is being approximated when a numerical method is used. The author outlines first order equations including linear and nonlinear equations and systems of differential equations, as well as linear differential equations including the Laplace transform, and variable coefficients, nonlinear differential equations, and boundary problems and PDEs. For those looking for a solid introduction to differential equations. This textbook is aimed at newcomers to nonlinear dynamics and chaos, especially students taking a first course in the subject. The presentation stresses analytical methods, concrete examples, and geometric intuition. The theory is developed systematically, starting with first-order differential equations and their bifurcations, followed by

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phase plane analysis, limit cycles and their bifurcations, and culminating with the Lorenz equations, chaos, iterated maps, period doubling, renormalization, fractals, and strange attractors.

This volume features computational tools that can be applied directly and are explained with simple calculations, plus an emphasis on control system principles and ideas. Includes worked examples, MATLAB macros, and solutions manual.

Solving ODEs with MATLAB

A First Course in Differential Equations with Modeling Applications

Differential Equations and Boundary Value Problems: Computing and Modeling, Global Edition

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This book uses elementary versions of modern methods found in sophisticated mathematics to discuss portions of "advanced calculus" in which the subtlety of the concepts and methods makes rigor difficult to attain at an elementary level.

This book offers readers a primer on the theory and applications of Ordinary Differential Equations. The style used is simple, yet thorough and rigorous. Each chapter ends with a broad set of exercises that range from the routine to the more challenging and thought-provoking. Solutions to selected exercises can be found at the end of the book. The book contains many interesting examples on topics such as electric circuits, the pendulum equation, the logistic equation, the Lotka-Volterra system, the Laplace

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Transform, etc., which introduce students to a number of interesting aspects of the theory and applications. The work is mainly intended for students of Mathematics, Physics, Engineering, Computer Science and other areas of the natural and social sciences that use ordinary differential equations, and who have a firm grasp of Calculus and a minimal understanding of the basic concepts used in Linear Algebra. It also studies a few more advanced topics, such as Stability Theory and Boundary Value Problems, which may be suitable for more advanced undergraduate or first-year graduate students. The second edition has been revised to correct minor errata, and features a number of carefully selected new exercises, together with more detailed explanations of some of the topics. A complete Solutions Manual, containing solutions to all the exercises published in the book, is available. Instructors who wish to adopt



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the book may request the manual by writing directly to one of the authors.

"Mathematica in Action, 2nd Edition," is designed both as a guide to the extraordinary capabilities of Mathematica as well as a detailed tour of modern mathematics by one of its leading expositors, Stan Wagon. Ideal for teachers, researchers, mathematica enthusiasts. This second edition of the highly successful W.H. Freeman version includes an 8 page full color insert and 50% new material all organized around Elementary Topics, Intermediate Applications, and Advanced Projects. In addition, the book uses Mathematica 3.0 throughout. Mathematica 3.0 notebooks with all the programs and examples discussed in the book are available on the TELOS web site ([www.telospub.com](http://www.telospub.com)). These notebooks contain materials suitable for DOS, Windows, Macintosh and Unix

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computers. Stan Wagon is well-known in the mathematics (and Mathematica) community as Associate Editor of the "American Mathematical Monthly," a columnist for the "Mathematical Intelligencer" and "Mathematica in Education and Research," author of "The Banach-Tarski Paradox" and "Unsolved Problems in Elementary Geometry and Number Theory (with Victor Klee), as well as winner of the 1987 Lester R. Ford Award for Expository Writing.

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**The program is primarily intended for undergraduate students of mathematics, science, or engineering, who typically take a course on differential equations during their first or second year of study. The main prerequisite for engaging with the program is a working knowledge of calculus, gained from a normal two- or three-semester course sequence or its equivalent. Some familiarity with matrices will also be helpful in the chapters on systems of differential equations.**

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may not be available in the ebook version. The second edition of Statics and Mechanics of Materials: An Integrated Approach continues to present students with an emphasis on the fundamental principles, with numerous applications to demonstrate and develop logical, orderly methods of procedure. Furthermore, the authors have taken measure to ensure clarity of the material for the student. Instead of deriving numerous formulas for all types of problems, the authors stress the use of free-body diagrams and the equations of equilibrium, together with the geometry of the deformed body and the observed

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### Division

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.

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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.

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