Ordinary Differential Equations: Applications, Models, and Computing (Textbooks in Mathematics)

Charles Roberts

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In the traditional curriculum, students rarely study nonlinear differential equations and nonlinear systems due to the difficulty or impossibility of computing explicit solutions manually. Although the theory associated with nonlinear systems is advanced, generating a numerical solution with a computer and interpreting that solution are fairly elementary. Bringing the computer into the classroom, **Ordinary Differential Equations: Applications, Models, and Computing** emphasizes the use of computer software in teaching differential equations.

Providing an even balance between theory, computer solution, and application, the text discusses the theorems and applications of the first-order initial value problem, including learning theory models, population growth models, epidemic models, and chemical reactions. It then examines the theory for n-th order linear differential equations and the Laplace transform and its properties, before addressing several linear differential equations with constant coefficients that arise in physical and electrical systems. The author also presents systems of first-order differential equations as well as linear systems with constant coefficients that arise in physical systems, such as coupled spring-mass systems, pendulum systems, the path of an electron, and mixture problems. The final chapter introduces techniques for determining the behavior of solutions to systems of first-order differential equations without first finding the solutions.

Designed to be independent of any particular software package, the book includes a CD-ROM with the software used to generate the solutions and graphs for the examples. The appendices contain complete instructions for running the software. A solutions manual is available for qualifying instructors.

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