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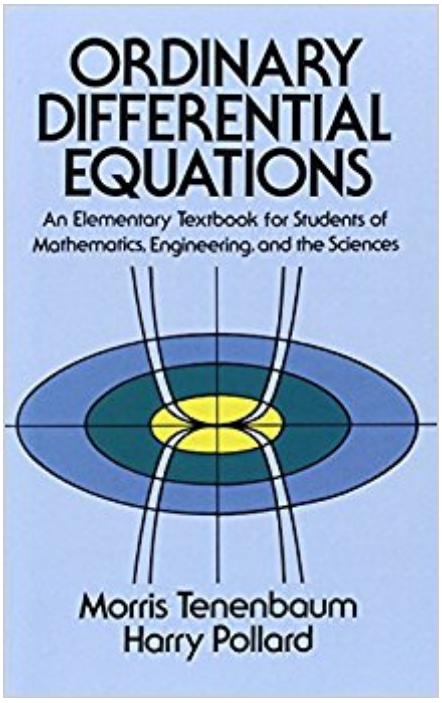
Ordinary Differential Equations (Dover Books On Mathematics)



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Synopsis

This unusually well-written, skillfully organized introductory text provides an exhaustive survey of ordinary differential equations â ” 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 â ” Morris Tenenbaum of Cornell University, and Harry Pollard of Purdue University â ” 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.

Book Information

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Customer Reviews

After going through this book and finishing a few weeks ago, and looking at some other comparable titles, I have to come to the conclusion that this is quite possibly overall the best introductory text on ODEs out there.The book consists of six major subtopics: first-order equations, general nth-order linear equations, systems and nonlinear equations, series solution methods, numerical solution methods and existence/uniqueness theorems. Most of the subjects tend to be divided into two or three chapters, with the first one or two containing the theoretical aspect and computational techniques and the other consisting of applications to real world problems.At some 800-odd pages the book is quite long, but the sheer amount of material covered is simply astounding; the book has several types of special ODEs and solution methods that I have not seen anywhere else, and the authors go to great lengths to make every concept fully clear to the reader while still being quite rigorous. I am personally somewhat pure-math oriented but also needed some practice with applied problems, and this text is sure to please both students of mathematics as well as those of the sciences due to the very large amounts of subject material contained in both areas. (the book is split about 55-45 in theory/application)One very nice thing is that if there is some doubt as to whether or not the reader is comfortable with something from another subject (i.e. real analysis), the book does not assume that the reader is familiar wih that topic, but rather it goes through a short review of the topic that is self-contained enough for readers who have not heard of the topic before to get a good idea of it.

Morris Tenenbaum and Harry Pollard’s 1963 first-rate introduction to _Ordinary Differential Equations_ remains the superlative text on the market.Compendious and catholic, the book contains 65 lessons organized into 12 chapters. The student learns method after method after method with comfort and ease. A typical lesson succinctly begins with explicatory material followed with completed examples. Each lesson ends with a problem set, and to the salvation of humanity, almost all of the answers are provided, making this book great for self-study, reference, and/or supplementation. A satisfactory calculus background should be the student’s only necessary qualification; the involved calculus often demands more perspiration than the differential equations

themselves. Those who repent shall receive redemption!Included applications, while eating considerable space, can be found compartmentalized in separate chapters. For instance, chapter 3 contains applications involving 1st order differential equations, including topics like interest, dilution and accretion, decomposition and growth, temperature, pursuit curves, the flow of water, rotation of a liquid in a cylinder, et cetera. Chapter 6 does the same thing with second order differential equations, dealing with undamped and damped motion, electric circuits, planetary motion, suspension cables, y'get the idea.Summarizing the more strictly mathematical content also presents itself as an impossible task.

This book is a must. For the undergrad, for the physicist, for the casual problem solver.Just for fun, I did a Google search using "Ordinary Differential Equations" as search text. I just wanted to see how my favorite differential equations textbook rated some forty years after it was printed and forty years after I worked my way through it alone without an instructor. I expected no response. I was very surprised (and pleased) to see it come up as the first item in the list: Tenenbaum and Pollard. I own the Harper and Row first edition, first printing, dated March, 1964, that I purchased in Japan. It belongs number one! Five Solid Stars. Kudos to Dover for reprinting the book. Dover is an essential reprint resourse.At the time I purchased the book, I was very interested in mathematics, engineering, and physics textbooks that one could read without the aid of an instructor as I was teaching myself mathematics, engineering, and physics without access to anyone who could field questions at this level. This is one of those very rare books that was written with the self taught student in mind, be it either accidental or intentional.Mathematics is supposed to be fun. Most math text books are notoriously less than ideally written and tedious to read. When I studied differential equations in class at the university, the text was not too well written and the course content followed the text. Neither could touch this gem which I had previously worked my way through.The examples are excellent and wide spectrum. They pull examples from all the many corners of physics, including everyday things pulled from the home that you do not give a second thought to.

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