

By J Douglas Faires Numerical Methods 3rd Third Edition

The applications chosen demonstrate concisely how numerical methods can be, and often must be, applied in real-life situations. With a wealth of examples and exercises, the text demonstrates the relevance of numerical analysis to a variety of disciplines and provides ample practice for students. The authors focus on building students' intuition to help them understand why the techniques presented work in general, and why, in some situations, they fail. Gives an introduction to the modern approximation techniques and explains how, why, and when the techniques can be expected to work fd36f78bf8

" —Mathematika An Introduction to Numerical Methods and Analysis addresses the mathematics underlying approximation and scientific computing and successfully explains where approximation methods come from, why they sometimes work (or don't work), and when to use one of the many techniques that are available. " —Zentrblatt Math ". Praise for the First Edition ". outstandingly appealing with regard to its style, contents, considerations of requirements of practice, choice of examples, and exercises. An Introduction to Numerical Methods and Analysis is the ideal text for students in advanced undergraduate mathematics and engineering courses who are interested in gaining an understanding of numerical methods and numerical analysis. A greater emphasis on applied exercises as well as the cause and effect associated with numerical mathematics is featured throughout the book. A selection of concepts required for the study of computational mathematics is introduced, and simple approximations using Taylor's Theorem are also treated in some depth. carefully structured with many detailed worked examples. " —The Mathematical Gazette ". an up-to-date and user-friendly account. Written in a style that emphasizes readability and usefulness for the numerical methods novice, the book begins with basic, elementary material and gradually builds up to more advanced topics. The text includes exercises that run the gamut from simple hand computations, to challenging derivations and minor proofs, to programming exercises fd36f78bf8

Solutions to odd-numbered exercises in the text fd36f78bf8

Ancillaries like Differential Equations with Mathematica and/or Differential Equations with Maple would be recommended and/or required ancillaries depending on the school, course, or instructor. Note that some schools might prefer to move the Laplace transform material to the second course, which is why we have placed the chapter on Laplace transforms in its location in the text. This text is for courses that are typically called (Introductory) Differential Equations, (Introductory) Partial Differential Equations, Applied Mathematics, Fourier Series and Boundary Value Problems. The texts follows a "traditional" curriculum and takes the "traditional" (rather than "dynamical systems") approach. The text is appropriate for two semester courses: the first typically emphasizes ordinary differential equations and their applications while the second emphasizes special techniques (like Laplace transforms) and partial differential equations. Introductory Differential Equations is a text that follows a traditional approach and is appropriate for a first course in ordinary differential equations (including Laplace transforms) and a second course in Fourier series and boundary value problems. *Technology Icons These icons highlight text that is intended to alert students that technology may be used intelligently to solve a problem, encouraging logical thinking and application * Think About It Icons and Examples Examples that end in a question encourage students to think critically about what to do next, whether it is to use technology or focus on a graph to determine an outcome *Differential Equations at Work These are projects requiring students to think critically by having students answer questions based on different conditions, thus engaging students fd36f78bf8

Featuring worked out-solutions to the problems in NUMERICAL METHODS, 3rd Edition, this manual shows you how to approach and solve problems using the same step-by-step explanations found in your textbook examples. Prepare for exams and succeed in your mathematics course with this comprehensive solutions manual fd36f78bf8

Readers learn why the numerical methods work, what kinds of errors to expect, and when an application might lead to difficulties. The authors also provide information about the availability of high-quality software for numerical approximation routines. The techniques are the same as those covered in the authors' top-selling Numerical Analysis text, but this text provides an overview for students who need to know the methods without having to perform the analysis. NUMERICAL METHODS, 4E, International Edition emphasizes the intelligent application of approximation techniques to the type of problems that commonly occur in engineering and the physical sciences. This concise approach still includes mathematical justifications, but only when they are necessary to understand the methods. The emphasis is placed on describing each technique from an implementation standpoint, and on convincing the reader that the method is reasonable both mathematically and computationally fd36f78bf8

In addition to these anticipated features, the book breaks new ground by including the latest results on the highly efficient G-symplectic methods which compete strongly with the well-known symplectic Runge-Kutta methods for long-term integration of conservative mechanical systems. A second feature is general linear methods which have now matured and grown from being a framework for a unified theory of a wide range of diverse numerical schemes to a source of new and practical algorithms in their own right. In addition to serving as a broad and comprehensive study of numerical methods for initial value problems, this book contains a special emphasis on Runge-Kutta methods by the mathematician who transformed the subject into its modern form dating from his classic 1963 and 1972 papers. The book is written in the lucid style characteristic of the author, and combines enlightening explanations with rigorous and precise analysis. This third edition of Numerical Methods for Ordinary Differential Equations will serve as a key text for senior undergraduate and graduate courses in numerical analysis, and is an essential resource for research workers in applied mathematics, physics and engineering. As the founder of general linear method research, John Butcher has been a leading contributor to its development; his special role is reflected in the text. A new edition of this classic work, comprehensively revised to present exciting new developments in this important subject The study of numerical methods for solving ordinary differential equations is constantly developing and regenerating, and this third edition of a popular classic volume, written by one of the world's leading experts in the field, presents an account of the subject which reflects both its historical and well-established place in computational science and its vital role as a cornerstone of modern

applied mathematics fd36f78bf8

"—The Mathematical Gazette The Second Edition of the highly regarded An Introduction to Numerical Methods and Analysis provides a fully revised guide to numerical approximation. carefully structured with many detailed worked examples.

"—Zentralblatt MATH \". outstandingly appealing with regard to its style, contents, considerations of requirements of practice, choice of examples, and exercises. A wide range of higher-level methods and solutions, including new topics such as the roots of polynomials, spectral collocation, finite element ideas, and Clenshaw-Curtis quadrature, are presented from an introductory perspective, and the Second Edition also features: Chapters and sections that begin with basic, elementary material followed by gradual coverage of more advanced material Exercises ranging from simple hand computations to challenging derivations and minor proofs to programming exercises Widespread exposure and utilization of MATLAB An appendix that contains proofs of various theorems and other material The book is an ideal textbook for students in advanced undergraduate mathematics and engineering courses who are interested in gaining an understanding of numerical methods and numerical analysis. The author clearly explains how to both construct and evaluate approximations for accuracy and performance, which are key skills in a variety of fields. The book continues to be accessible and expertly guides readers through the many available techniques of numerical methods and analysis. An Introduction to Numerical Methods and Analysis, Second Edition reflects the latest trends in the field, includes new material and revised exercises, and offers a unique emphasis on applications. Praise for the First Edition \" fd36f78bf8

Emphasizing the finite difference approach for solving differential equations, the second edition of Numerical Methods for Engineers and Scientists presents a methodology for systematically constructing individual computer programs. Providing easy access to accurate solutions to complex scientific and engineering problems, each chapter begins with objectives, a discussion of a representative application, and an outline of special features, summing up with a list of tasks students should be able to complete after reading the chapter- perfect for use as a study guide or for review. The AIAA Journal calls the book \". \". a good, solid instructional text on the basic tools of numerical analysis fd36f78bf8

This concise approach still includes mathematical justifications, but only when they are necessary to understand the methods. NUMERICAL METHODS, Fourth Edition emphasizes the intelligent application of approximation techniques to the type of problems that commonly occur in engineering and the physical sciences. The techniques are the same as those covered in the authors' top-selling Numerical Analysis text, but this text provides an overview for students who need to know the methods without having to perform the analysis. Students learn why the numerical methods work, what kinds of errors to expect, and when an application might lead to difficulties. The emphasis is placed on describing each technique from an implementation standpoint, and on convincing the student that the method is reasonable both mathematically and computationally. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version. The authors also provide information about the availability of high-quality software for numerical approximation routines fd36f78bf8

This innovative publication brings together a skillful treatment of MATLAB and programming alongside theory and modeling. Systematic use is made of MATLAB's superb graphical capabilities to display and analyze results. An extensive chapter on the finite element method covers enough practical aspects (including mesh generation) to enable the reader to numerically solve general elliptic boundary value problems. With its thorough coverage of analytic concepts, geometric concepts, programs and algorithms, and applications, this is an unsurpassed pedagogical tool. The text consists of three parts: Introduction to MATLAB and numerical preliminaries, which introduces readers to the software and its graphical capabilities and shows how to use it to write programs Ordinary Differential Equations Partial Differential Equations All the tools needed to master using MATLAB to solve differential equations are provided and include: \"Exercises for the Reader\" that range from routine computations to more advanced conceptual and theoretical questions (solutions appendix included) Illustrative examples, provided throughout the text, that demonstrate MATLAB's powerful ability to solve differential equations Explanations that are rigorous, yet written in a very accessible, user-friendly style Access to an FTP site that includes downloadable files of all the programs developed in the text This textbook can be tailored for courses in numerical differential equations and numerical analysis as well as traditional courses in ordinary and/or partial differential equations. By presenting these topics in tandem, the author enables and encourages readers to perform their own computer experiments, leading them to a more profound understanding of differential equations. Learn how to solve complex differential equations using MATLAB® Introduction to Numerical Ordinary and Partial Differential Equations Using MATLAB® teaches readers how to numerically solve both ordinary and partial differential equations with ease. All the material has been classroom-tested over the course of many years, with the result that any self-learner with an understanding of basic single-variable calculus can master this topic fd36f78bf8

The book provides a rigorous mathematical foundation for modeling and computer simulation. It covers model formulation, simulation model execution, and the model building process with its key activities model abstraction and model simplification, as well as the organization of model libraries. It provides a comprehensive framework for modeling and simulation integrating the various simulation approaches. Every complex design project, from integrated circuits, to aerospace vehicles, to industrial manufacturing processes requires these new methods. The increased computational power and software tools available to engineers have increased the use and dependence on modeling and computer simulation throughout the design process. /graduate level course in all EE departments worldwide and all professionals in this area are required to update their skills. The book also discusses simulation execution on parallel and distributed machines and concepts for simulation model realization based on the High Level Architecture (HLA) standard of the Department of Defense. Presents a working foundation necessary for compliance with High Level Architecture (HLA) standards Provides a comprehensive framework for continuous and discrete event modeling and simulation Explores the mathematical foundation of simulation modeling Discusses system morphisms for model abstraction and simplification Presents a new approach to discrete event simulation of continuous processes Includes parallel and distributed simulation of discrete event models Presents a concept to achieve simulator interoperability in the form of the DEVS-Bus. This book fulfills the essential need of system and control engineers at all levels in understanding modeling and simulation. This book, written as a true text/reference has become a standard sr. Emphasis of the book is in particular in integrating discrete event and continuous modeling approaches as well as a new approach for discrete event simulation of continuous processes. These tools have given engineers the capability of designing highly complex systems

and computer architectures that were previously unthinkable fd36f78bf8

Initial-value problems for ordinary differential equations -- 6. Interpolation and polynomial approximation -- 4. Solutions of equations in one variable -- 3. Approximating eigenvalues -- 10. Boundary-value problems for ordinary differential equations -- 12. Numerical differentiation and integration -- 5. 1. Approximation theory -- 9. Mathematical preliminaries and error analysis -- 2. Iterative techniques in matrix algebra -- 8. Direct methods for solving linear systems -- 7. Numerical solutions to partial differential equations. Local Subj. Numerical solutions of nonlinear systems of equations -- 11 fd36f78bf8

This inexpensive paperback edition of a groundbreaking text stresses frequency approach in coverage of algorithms, polynomial approximation, Fourier approximation, exponential approximation, and other topics. Revised and enlarged 2nd edition fd36f78bf8

This book will give readers the possibility of finding very important mathematical tools for working with fractional models and solving fractional differential equations, such as a generalization of Stirling numbers in the framework of fractional calculus and a set of efficient numerical methods. We will also discuss the relationship between semi-Markov continuous-time random walks and the space-time fractional diffusion equation, which generalizes the usual theory relating random walks to the diffusion equation. In particular, the numerical methods listed in the book are presented in a readily accessible way that immediately allows the readers to implement them on a computer in a programming language of their choice. This book will keep in mind the trade-off between full mathematical rigor and the needs of readers coming from different applied areas of science and engineering. The second edition of the book has been expanded and now includes a discussion of additional, newly developed numerical methods for fractional calculus and a chapter on the application of fractional calculus for modeling processes in the life sciences. Moreover, we will introduce some applied topics, in particular fractional variational methods which are used in physics, engineering or economics. These methods can be applied in finance, to model tick-by-tick (log)-price fluctuations, in insurance theory, to study ruin, as well as in macroeconomics as prototypical growth models. All these topics are complementary to what is dealt with in existing books on fractional calculus and its applications fd36f78bf8

It also illustrates the calls required for the programs using the algorithms in the text, which is especially useful for those with limited programming experience. The Student Solutions Manual contains worked-out solutions to many of the problems fd36f78bf8

Theory and Applications of Numerical Analysis is a self-contained Second Edition, providing an introductory account of the main topics in numerical analysis. Both theoretical and practical examples are included. The book emphasizes both the theorems which show the underlying rigorous mathematics and the algorithms which define precisely how to program the numerical methods. a unique blend of theory and applications two brand new chapters on eigenvalues and splines inclusion of formal algorithms numerous fully worked examples a large number of problems, many with solutions fd36f78bf8

The authors provide a sophisticated introduction to various appropriate approximation techniques; they show students why the methods work, what type of errors to expect, and when an application might lead to difficulties; and they provide information about the availability of high-quality software for numerical approximation routines The techniques covered in this text are essentially the same as those covered in the Sixth Edition of these authors' top-selling Numerical Analysis text, but the emphasis is much different. The emphasis is placed on describing each technique from an implementation standpoint, and on convincing the student that the method is reasonable both mathematically and computationally. In Numerical Methods, Second Edition, full mathematical justifications are provided only if they are concise and add to the understanding of the methods. This text emphasizes the intelligent application of approximation techniques to the type of problems that commonly occur in engineering and the physical sciences fd36f78bf8

Contains worked solutions to all of the exercises in the text. For instructors only fd36f78bf8

This undergraduate textbook introduces students to the topic with a unique approach that emphasizes the modern finite element method alongside the classical method of Fourier analysis. Partial differential equations (PDEs) are essential for modeling many physical phenomena fd36f78bf8

This text emphasizes the intelligent application of approximation techniques to the type of problems that commonly occur in engineering and the physical sciences. The techniques are essentially the same as those covered in the authors' top-selling Numerical Analysis text, but in this text, full mathematical justifications are provided only if they are concise and add to the understanding of the methods. Students learn why the numerical methods work, what type of errors to expect, and when an application might lead to difficulties. The authors also provide information about the availability of high-quality software for numerical approximation routines. The emphasis is placed on describing each technique from an implementation standpoint, and on convincing the student that the method is reasonable both mathematically and computationally fd36f78bf8

7. Review Exercises. Generalized Fourier Series. 6. Differential Equations at Work. Theory of First-Order-Equations. Boundary-Value Problems, Eigenvalue Problems, Sturm-Liouville Problems. Exact Equations. Laplace Transform Methods for Solving Systems. Fourier Sine Series and Cosine Series. 5. The Tautochrone. Preliminary Definitions and Notation. Modeling a Fox Population in Which Rabies is Present. Summary. Aging Springs. Problems in Two Dimensions: Laplace's Equation. Index. Population Growth and Decay. Summary. Chemical Reactor. Higher Order Equations. Laplace Transforms. Mathematics of Finance. Nonhomogeneous Equations with Constant Coefficients: Variation of Parameters. Modeling the Spread of a Disease. Nonlinear Systems. Review Exercises. Summary. The One-Dimensional Heat Equation. Soft Springs. Summary. Numerical Methods for First-Order Equations. Introduction. Introduction to Solving Nonhomogeneous Equations with Constant Coefficients: Method of Undetermined Coefficients. Numerical Methods for Solving Partial Differential Equations. Differential Equations at Work. Partial Differential Equations. Systems of First Order Equations. Damped Motion. Review Exercises. 2. Review Exercises. Solving Initial-Value Problems with the Laplace Transform. 4. FitzHugh-Nagumo Model. Testing for Diabetes. Fourier Series. Forced Damped Spring-Mass System. Mechanical and Electrical Problems with First-Order Linear Systems. Answers to Selected Questions. Hard Springs. Summary. Logistic Model with Harvesting. Bodé Plots. Antibiotic

Production. The Pendulum Problem. Introduction. Introduction to Partial Differential Equations and Separation of Variables. Controlling the Spread of Disease. Summary. Applications of First Order Equations. Modeling the Motion of a Skier. 8. Cauchy-Euler Equations. First Order Equations. The Laplace Transform: Preliminary Definitions and Notation. Summary. 10. Other Applications. Applications Using Laplace Transforms. Separable Equations. Linear Population Model with Harvesting. Review Exercises. Introduction to Differential Equations. Two-Dimensional Problems in a Circular Region. Logistic Model with Predation. Fourier Series. Simple Harmonic Motion. Applications of First-Order Systems. Differential Equations at Work. Waves in a Steel Rod. First-Order Linear Equations. Media Sterilization. Series Solutions of Ordinary Differential Equations. Review Exercises. Numerical Methods. The One-Dimensional Wave Equation. The Schrödinger Equation. Forced Motion. Differential Equations at Work. Differential Equations at Work. The Convolution Theorem. Solutions to Higher Order Linear Homogeneous Equations with Constant Coefficients. Laplace Transforms. Dialysis. Substitution Methods and Special Equations. Differential Equations at Work. Summary. First-Order Linear Homogeneous Systems with Constant Coefficients. Differential Equations at Work. Summary. 3. Competing Species. Applications of Higher Order Equations. Review Exercises. Food Chains. Vibration Absorbers. Nonlinear Systems of Equations. Second-Order Equations: An Introduction. Review Exercises. Algae Growth. A Graphical Approach to Solutions: Slope Fields and Direction Fields. 1. Phase Portraits. Rack-and-Gear Systems. Summary. Chapter 3 Differential Equations at Work. 9. Approximations with Fourier Series. Airplane Wing. Higher Order Equations: An Introduction. Free Vibration of a Three-Story Building. Free Vibration of a Three-Story Building. Free-Falling Bodies. Control Systems. Review of Matrix Algebra and Calculus. Solutions of Second-Order Linear Homogeneous Equations with Constant Coefficients. Laplace Transforms of Several Important Functions. Diffusion and Population Problems with First-Order Linear Systems. Differential Equations at Work. First-Order Linear Nonhomogeneous Systems: Undetermined Coefficients and Variation of Parameters. Review Exercises. Newton's Law of Cooling and Related Problems. Review Exercises fd36f78bf8

The book combines clear descriptions of the three methods, their reliability, and practical implementation aspects. Aimed primarily at students of Engineering, Mathematics, Computer Science, Physics and Chemistry among others this book offers a substantial insight into the principles numerical methods in this class of problems are based upon. The book can also be used as a reference for research work on numerical methods for PDE's. Justifications for why numerical methods for the main classes of PDE's work or not, or how well they work, are supplied and exemplified. Numerical Methods for Partial Differential Equations: An Introduction Vitoriano Ruas, Sorbonne Universités, UPMC - Université Paris 6, France A comprehensive overview of techniques for the computational solution of PDE's Numerical Methods for Partial Differential Equations: An Introduction covers the three most popular methods for solving partial differential equations: the finite difference method, the finite element method and the finite volume method. Key features: A balanced emphasis is given to both practical considerations and a rigorous mathematical treatment The reliability analyses for the three methods are carried out in a unified framework and in a structured and visible manner, for the basic types of PDE's Special attention is given to low order methods, as practitioner's overwhelming default options for everyday use New techniques are employed to derive known results, thereby simplifying their proof Supplementary material is available from a companion website fd36f78bf8

Numerical Analysis fd36f78bf8

In the this proceedings you can find the carefully reviewed scientific outcome of the second International Conference on Electronic Commerce, Web Application and Communication (ECWAC 2012) held at March 17-18,2012 in Wuhan, China, bringing together researchers from all around the world in the field. ECWAC2012 is an integrated conference devoted to Electronic Commerce, Web Application and Communication fd36f78bf8

This volume is designed as an introduction to the concepts of modern numerical analysis as they apply to partial differential equations. The book contains many practical problems and their solutions, but at the same time, strives to expose the pitfalls--such as overstability, consistency requirements, and the danger of extrapolation to nonlinear problems methods used on linear problems. This new edition is a drastic revision of the previous one, with new material on boundary elements, spectral methods, the methods of lines, and invariant methods. At the same time, the new edition retains the self-contained nature of the older version, and shares the clarity of its exposition and the integrity of its presentation. Material on finite elements and finite differences have been merged, and now constitute equal partners Additional material has been added on boundary elements, spectral methods, the method of lines, and invariant methods References have been updated, and reflect the additional material Self-contained nature of the Second Edition has been maintained Very suitable for PDE courses. Numerical Methods for Partial Differential Equations, Third Edition reflects the great accomplishments that have taken place in scientific computation in the fifteen years since the Second Edition was published fd36f78bf8

O'Malley, Jr. The third edition of this concise, popular textbook on elementary differential equations gives instructors an alternative to the many voluminous texts on the market. , SIAM Review, Vol. From the reviews of the second edition: "The coverage of linear systems in the plane is nicely detailed and illustrated. Satzer, MAA Reviews, January, 2011. The overarching perspective of the text conveys that differential equations are about applications. com. MATLAB® is not required; students are encouraged to utilize available software to plot many of their solutions. This edition contains a healthy increase over earlier editions in the number of worked examples and exercises, particularly those routine in nature. " —Robert E. select Dave Logan's new and improved text for my course. This book is worth a careful look as a candidate text for the next differential equations course you teach. " —William J. Instructors are likely to find that the first four or five chapters are suitable for a first course in the subject. It presents a thorough treatment of the standard topics in an accessible, easy-to-read, format. Solutions to even-numbered problems are available on springer. Simple numerical methods are illustrated and the use of Maple and MATLAB is encouraged. 53 (2), 2011 "Aims to provide material for a one-semester course that emphasizes the basic ideas, solution methods, and an introduction to modeling. The book that results offers a concise introduction to the subject for students of mathematics, science and engineering who have completed the introductory calculus sequence. This book illuminates the mathematical theory in the text with a wide variety of applications that will appeal to students in physics, engineering, the biosciences, economics and mathematics. Two appendices include a review with practice problems, and a MATLAB® supplement that gives basic codes and commands for solving differential equations fd36f78bf8

Numerous examples and problems interspersed throughout the presentations Each extensive chapter contains a preview and objectives Includes topics not found in similar books, such as a review of general algebra and an introduction to group theory Provides chemistry-specific instruction without the distraction of abstract concepts or theoretical issues in pure mathematics. This 4e includes new exercises in each chapter that provide practice in a technique immediately after discussion or example and encourage self-study. The early chapters are constructed around a sequence of mathematical topics, with a gradual progression into more advanced material. This book specifically emphasizes the use of mathematics in the context of physical chemistry, as opposed to being simply a mathematics text. A final chapter discusses mathematical topics needed in the analysis of experimental data. Mathematics for Physical Chemistry is the ideal supplementary text for practicing chemists and students who want to sharpen their mathematics skills while enrolled in general through physical chemistry courses fd36f78bf8

S. The first seven chapters deal with Maple and the last eight with C. Department of Energy-funded Undergraduate Computation in Engineering Science (UCES) program. The textbook will contain 20 to 30 chapters covering a similar mix of concepts at a finer level of detail. The computational techniques needed to solve the problem are developed as necessary, making the motivation for learning the computing always apparent. Each chapter will introduce a single problem that will be used to motivate a single computing concept. Each chapter begins by introducing a problem and then guiding the student through its solution. The notes currently consist of 15 chapters. \"Introduction to Computational Science\" was developed over a period of two years at the University of Utah Department of Computer Science in conjunction with the U fd36f78bf8

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