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Ordinary Differential Equations - Kenneth B. Howell 2019-12-11
The Second Edition of Ordinary Differential Equations: An Introduction to the Fundamentals builds on the successful First Edition. It is unique in its approach to motivation, precision, explanation and method. Its layered approach offers the instructor opportunity for greater flexibility in coverage and depth. Students will appreciate the author's approach and engaging style. Reasoning behind concepts and computations motivates readers. New topics are introduced in an easily accessible manner before being further developed later. The author emphasizes a basic understanding of the principles as well as modeling, computation procedures and the use of technology. The students will further appreciate the guides for carrying out the lengthier computational procedures with illustrative examples integrated into the discussion. Features of the Second Edition: Emphasizes motivation, a basic understanding of the mathematics, modeling and use of technology A layered approach that allows for a flexible presentation based on instructor's preferences and students' abilities An instructor's guide suggesting how the text can be applied to different courses New chapters on more advanced numerical methods and systems (including the Runge-Kutta method and the numerical solution of second- and higher-order equations) Many additional exercises, including two "chapters" of review exercises for first- and higher-order differential equations An extensive on-line solution manual About the author: Kenneth B. Howell earned bachelor's degrees in both mathematics and physics from Rose-Hulman Institute of Technology, and master's and doctoral degrees in mathematics from Indiana University. For more than thirty years, he was a professor in the Department of Mathematical Sciences of the University of Alabama in Huntsville. Dr. Howell published numerous research articles in applied and theoretical mathematics in prestigious journals, served as a consulting research scientist for various companies and federal agencies in the space and defense industries, and received awards from the College and University for outstanding teaching. He is also the author of Principles of Fourier Analysis, Second Edition (Chapman & Hall/CRC, 2016).

Introduction to Numerical Computations - James S. Vandergraft 2014-05-10

Computer Science and Applied Mathematics: Introduction to Numerical Computations, Second Edition introduces numerical algorithms as they are used in practice. This edition covers the usual topics contained in introductory numerical analysis textbooks that include all of the well-known and most frequently used algorithms for interpolation and approximation, numerical differentiation and integration, solution of linear systems and nonlinear equations, and solving ordinary differential equations. A complete discussion of computer arithmetic, problems that arise in the computer evaluation of functions, and cubic spline interpolation are also provided. This text likewise discusses the Newton formulas for interpolation and adaptive methods for integration. The level of this book is suitable for advanced undergraduate students and readers with elementary mathematical background.

Programming for Computations - Python - Svein Linge 2016-07-25
This book presents computer programming as a key method for solving mathematical problems. There are two versions of the book, one for MATLAB and one for Python. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows the students to write simple programs for solving common mathematical problems with numerical methods in engineering and science courses. The emphasis is on generic algorithms, clean design

of programs, use of functions, and automatic tests for verification. **Introduction To Numerical Computation, An (Second Edition)** - Wen Shen 2019-08-28

This book serves as a set of lecture notes for a senior undergraduate level course on the introduction to numerical computation, which was developed through 4 semesters of teaching the course over 10 years. The book requires minimum background knowledge from the students, including only a three-semester of calculus, and a bit on matrices. The book covers many of the introductory topics for a first course in numerical computation, which fits in the short time frame of a semester course. Topics range from polynomial approximations and interpolation, to numerical methods for ODEs and PDEs. Emphasis was made more on algorithm development, basic mathematical ideas behind the algorithms, and the implementation in Matlab. The book is supplemented by two sets of videos, available through the author's YouTube channel. Homework problem sets are provided for each chapter, and complete answer sets are available for instructors upon request. The second edition contains a set of selected advanced topics, written in a self-contained manner, suitable for self-learning or as additional material for an honored version of the course. Videos are also available for these added topics.

Programming for Computations - MATLAB/Octave Svein Linge 2016-08-01

This book presents computer programming as a key method for solving mathematical problems. There are two versions of the book, one for MATLAB and one for Python. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows the students to write simple programs for solving common mathematical problems with numerical methods in engineering and science courses. The emphasis is on generic algorithms, clean design of programs, use of functions, and automatic tests for verification.

Solving ODEs with MATLAB - Lawrence F. Shampine 2003-04-28

This book, first published in 2003, provides a concise but sound treatment of ODEs, including IVPs, BVPs, and DDEs.

Parallel Computational Technologies - Leonid Sokolinsky 2018-08-25

This book constitutes the refereed proceedings of the 12th International Conference on Parallel Computational Technologies, PCT 2018, held in Rostov-on-Don, Russia, in April 2018. The 24 revised full papers presented were carefully reviewed and selected from 167 submissions. The papers are organized in topical sections on high performance architectures, tools and technologies; parallel numerical algorithms; supercomputer simulation.

Proceedings - 1978

B-Series John C. Butcher 2021-04-01

B-series, also known as Butcher series, are an algebraic tool for analysing solutions to ordinary differential equations, including approximate solutions. Through the formulation and manipulation of these series, properties of numerical methods can be assessed. Runge-Kutta methods, in particular, depend on B-series for a clean and elegant approach to the derivation of high order and efficient methods. However, the utility of B-series goes much further and opens a path to the design and construction of highly accurate and efficient multivalued methods. This book offers a self-contained introduction to B-series by a pioneer of the subject. After a preliminary chapter providing background on differential equations and numerical methods, a broad exposition of graphs and trees is presented. This is essential preparation for the third chapter, in which the main ideas of B-series are introduced and

developed. In chapter four, algebraic aspects are further analysed in the context of integration methods, a generalization of Runge-Kutta methods to infinite index sets. Chapter five, on explicit and implicit Runge-Kutta methods, contrasts the B-series and classical approaches. Chapter six, on multivalued methods, gives a traditional review of linear multistep methods and expands this to general linear methods, for which the B-series approach is both natural and essential. The final chapter introduces some aspects of geometric integration, from a B-series point of view. Placing B-series at the centre of its most important applications makes this book an invaluable resource for scientists, engineers and mathematicians who depend on computational modelling, not to mention computational scientists who carry out research on numerical methods in differential equations. In addition to exercises with solutions and study notes, a number of open-ended projects are suggested. This combination makes the book ideal as a textbook for specialised courses on numerical methods for differential equations, as well as suitable for self-study.

Numerical Methods in Software and Analysis - John R. Rice
2014-05-19

Numerical Methods, Software, and Analysis, Second Edition introduces science and engineering students to the methods, tools, and ideas of numerical computation. Introductory courses in numerical methods face a fundamental problem—there is too little time to learn too much. This text solves that problem by using high-quality mathematical software. In fact, the objective of the text is to present scientific problem solving using standard mathematical software. This book discusses numerous programs and software packages focusing on the IMSL library (including the PROTRAN system) and ACM Algorithms. The book is organized into three parts. Part I presents the background material. Part II presents the principal methods and ideas of numerical computation. Part III contains material about software engineering and performance evaluation. A uniform approach is used in each area of numerical computation. First, an intuitive development is made of the problems and the basic methods for their solution. Then, relevant mathematical software is reviewed and its use outlined. Many areas provide extensive examples and case studies. Finally, a deeper analysis of the methods is presented as in traditional numerical analysis texts. Emphasizes the use of high-quality mathematical software for numerical computation Extensive use of IMSL routines Features extensive examples and case studies

Elementary Differential Equations - Charles Roberts 2018-12-13

Elementary Differential Equations, Second Edition is written with the knowledge that there has been a dramatic change in the past century in how solutions to differential equations are calculated. However, the way the topic has been taught in introductory courses has barely changed to reflect these advances, which leaves students at a disadvantage. This second edition has been created to address these changes and help instructors facilitate new teaching methods and the latest tools, which includes computers. The text is designed to help instructors who want to use computers in their classrooms. It accomplishes this by emphasizing and integrating computers in teaching elementary or ordinary differential equations. Many examples and exercises included in the text require the use of computer software to solve problems. It should be noted that since instructors use their own preferred software, this book has been written to be independent of any specific software package. Features: Focuses on numerical methods and computing to generate solutions Features extensive coverage of nonlinear differential equations and nonlinear systems Includes software programs to solve problems in the text which are located on the author's website Contains a wider variety of non-mathematical models than any competing textbook This second edition is a valuable, up-to-date tool for instructors teaching courses about differential equations. It serves as an excellent introductory textbook for undergraduate students majoring in applied mathematics, computer science, various engineering disciplines and other sciences. They also will find that the textbook will aid them greatly in their professional careers because of its instructions on how to use computers to solve equations.

An Introduction to Numerical Methods and Analysis - James F. Epperson 2013-06-06

Praise for the First Edition ". . . outstandingly appealing with regard to its style, contents, considerations of requirements of practice, choice of examples, and exercises." —Zentrablatt Math ". . . carefully structured with many detailed worked examples . . ." —The Mathematical Gazette ". . . an up-to-date and user-friendly account . . ." —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. 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. 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. The text includes exercises that run the gamut from simple hand computations, to challenging derivations and minor proofs, to programming exercises. A greater emphasis on applied exercises as well as the cause and effect associated with numerical mathematics is featured throughout the book. 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.

Numerical Solution of Ordinary Differential Equations - Kendall Atkinson
2011-10-24

A concise introduction to numerical methods and the mathematical framework needed to understand their performance Numerical Solution of Ordinary Differential Equations presents a complete and easy-to-follow introduction to classical topics in the numerical solution of ordinary differential equations. The book's approach not only explains the presented mathematics, but also helps readers understand how these numerical methods are used to solve real-world problems. Unifying perspectives are provided throughout the text, bringing together and categorizing different types of problems in order to help readers comprehend the applications of ordinary differential equations. In addition, the authors' collective academic experience ensures a coherent and accessible discussion of key topics, including: Euler's method Taylor and Runge-Kutta methods General error analysis for multi-step methods Stiff differential equations Differential algebraic equations Two-point boundary value problems Volterra integral equations Each chapter features problem sets that enable readers to test and build their knowledge of the presented methods, and a related Web site features MATLAB® programs that facilitate the exploration of numerical methods in greater depth. Detailed references outline additional literature on both analytical and numerical aspects of ordinary differential equations for further exploration of individual topics. Numerical Solution of Ordinary Differential Equations is an excellent textbook for courses on the numerical solution of differential equations at the upper-undergraduate and beginning graduate levels. It also serves as a valuable reference for researchers in the fields of mathematics and engineering.

A First Course in Differential Equations - J. David Logan 2006-05-20

There are many excellent texts on elementary differential equations designed for the standard sophomore course. However, in spite of the fact that most courses are one semester in length, the texts have evolved into calculus-like presentations that include a large collection of methods and applications, packaged with student manuals, and Web-based notes, projects, and supplements. All of this comes in several hundred pages of text with busy formats. Most students do not have the time or desire to read voluminous texts and explore internet supplements. The format of this differential equations book is different; it is a one-semester, brief treatment of the basic ideas, models, and solution methods. Its limited coverage places it somewhere between an outline and a detailed textbook. I have tried to write concisely, to the point, and in plain language. Many worked examples and exercises are included. A student who works through this primer will have the tools to go to the next level in applying differential equations to problems in engineering, science, and applied mathematics. It can give some instructors, who want more concise coverage, an alternative to existing texts.

Non-Newtonian Calculus - Michael Grossman 1972

The non-Newtonian calculi provide a wide variety of mathematical tools for use in science, engineering, and mathematics. They appear to have considerable potential for use as alternatives to the classical calculus of Newton and Leibniz. It may well be that these calculi can be used to define new concepts, to yield new or simpler laws, or to formulate or solve problems.

Solving Differential Equations - Karim Soetaert 2012-06-06

Mathematics plays an important role in many scientific and engineering disciplines. This book deals with the numerical solution of differential equations, a very important branch of mathematics. Our aim is to give a practical and theoretical account of how to solve a large variety of differential equations, comprising ordinary differential equations, initial value problems and boundary value problems, differential algebraic

equations, partial differential equations and delay differential equations. The solution of differential equations using R is the main focus of this book. It is therefore intended for the practitioner, the student and the scientist, who wants to know how to use R for solving differential equations. However, it has been our goal that non-mathematicians should at least understand the basics of the methods, while obtaining entrance into the relevant literature that provides more mathematical background. Therefore, each chapter that deals with R examples is preceded by a chapter where the theory behind the numerical methods being used is introduced. In the sections that deal with the use of R for solving differential equations, we have taken examples from a variety of disciplines, including biology, chemistry, physics, pharmacokinetics. Many examples are well-known test examples, used frequently in the field of numerical analysis.

Historical Collections - University of Colorado 1920

Consists of various sub-series, called: Colony series, Mining series, Political series.

General Linear Methods for Ordinary Differential Equations - Zdzislaw Jackiewicz 2009-08-14

Learn to develop numerical methods for ordinary differential equations General Linear Methods for Ordinary Differential Equations fills a gap in the existing literature by presenting a comprehensive and up-to-date collection of recent advances and developments in the field. This book provides modern coverage of the theory, construction, and implementation of both classical and modern general linear methods for solving ordinary differential equations as they apply to a variety of related areas, including mathematics, applied science, and engineering. The author provides the theoretical foundation for understanding basic concepts and presents a short introduction to ordinary differential equations that encompasses the related concepts of existence and uniqueness theory, stability theory, and stiff differential equations and systems. In addition, a thorough presentation of general linear methods explores relevant subtopics such as pre-consistency, consistency, stage-consistency, zero stability, convergence, order- and stage-order conditions, local discretization error, and linear stability theory. Subsequent chapters feature coverage of: Differential equations and systems Introduction to general linear methods (GLMs) Diagonally implicit multistage integration methods (DIMSIMs) Implementation of DIMSIMs Two-step Runge-Kutta (TSRK) methods Implementation of TSRK methods GLMs with inherent Runge-Kutta stability (IRKS) Implementation of GLMs with IRKS General Linear Methods for Ordinary Differential Equations is an excellent book for courses on numerical ordinary differential equations at the upper-undergraduate and graduate levels. It is also a useful reference for academic and research professionals in the fields of computational and applied mathematics, computational physics, civil and chemical engineering, chemistry, and the life sciences.

Richardson Extrapolation - Zahari Zlatev 2017-11-07

Scientists and engineers are mainly using Richardson extrapolation as a computational tool for increasing the accuracy of various numerical algorithms for the treatment of systems of ordinary and partial differential equations and for improving the computational efficiency of the solution process by the automatic variation of the time-stepsizes. A third issue, the stability of the computations, is very often the most important one and, therefore, it is the major topic studied in all chapters of this book. Clear explanations and many examples make this text an easy-to-follow handbook for applied mathematicians, physicists and engineers working with scientific models based on differential equations. Contents The basic properties of Richardson extrapolation Richardson extrapolation for explicit Runge-Kutta methods Linear multistep and predictor-corrector methods Richardson extrapolation for some implicit methods Richardson extrapolation for splitting techniques Richardson extrapolation for advection problems Richardson extrapolation for some other problems General conclusions

Numerical Methods for Engineers - Steven C. Chapra 2006

The fifth edition of Numerical Methods for Engineers with Software and Programming Applications continues its tradition of excellence. The revision retains the successful pedagogy of the prior editions. Chapra and Canale's unique approach opens each part of the text with sections called Motivation, Mathematical Background, and Orientation, preparing the student for what is to come in a motivating and engaging manner. Each part closes with an Epilogue containing sections called Trade-Offs, Important Relationships and Formulas, and Advanced Methods and Additional References. Much more than a summary, the Epilogue deepens understanding of what has been learned and provides a peek

into more advanced methods. Users will find use of software packages, specifically MATLAB and Excel with VBA. This includes material on developing MATLAB m-files and VBA macros. Also, many, many more challenging problems are included. The expanded breadth of engineering disciplines covered is especially evident in the problems, which now cover such areas as biotechnology and biomedical engineering
Calculus - Al Shenk 2000

Al Shenk's Calculus combines innovative constructivist pedagogy with sound mathematical content to provide a real option for instructors seeking an effective balance between reform techniques and traditional content. A comprehensive table of contents, plenty of examples, and a wide range of exercises make sure students consider, practice, and then expand essential concepts and skills. The author provides constant checks along the way to monitor the student's progress. Questions follow each concept in the exposition to make sure the student is prepared to proceed. Tune-Up Exercises precede the end-of-chapter exercises to ensure the student's basic understanding of the material before tackling the challenging conceptual problems in the exercise sets. This regimen promotes skill maintenance that will help the student understand all of the concepts, forming a firm structure for mastery of the course.

*Questions woven into the exposition of concepts involve students in constructing their own understanding of the material. Students answer the Questions as they read and study the material to develop their own understanding *Tune-Up Exercises immediately before the problem sets highlight

Visual Mathematics, Illustrated by the TI-92 and the TI-89 - George C. Dorner 2013-12-01

The aim of this book is to present basic and advanced mathematical concepts using the graphical and traditional calculator, the TI 92 and the TI 89. These mathematical concepts are commonly taught at some stage of the first three years of college curricula; Analysis (approximations, convergence, differential equations, etc.) Linear Algebra (orthogonality, reduction, etc.). The idea behind this book is totally original and will teach the reader not only all the necessary theorems and examples, but illustrations of the calculator screens and the programs (short versions) will allow the reader to visualize these new concepts directly from the book, or on the calculator, leading to a better understanding through "seeing" and "touching" the mathematical lesson being taught.

Numerical Methods that Work - Forman S. Acton 2020-07-31

Vibration of solids and structures under moving loads - L. Fryba 2013-04-18

Transport engineering structures are subjected to loads that vary in both time and space. In general mechanics parlance such loads are called moving loads. It is the aim of the book to analyze the effects of this type of load on various elements, components, structures and media of engineering mechanics. In recent years all branches of transport have experienced great advances characterized by increasingly higher speeds and weights of vehicles. As a result, structures and media over or in which the vehicles move have been subjected to vibrations and dynamic stresses far larger than ever before. The author has studied vibrations of elastic and inelastic bodies and structures under the action of moving loads for many years. In the course of his career he has published a number of papers dealing with various aspects of the problem. On the strength of his studies he has arrived at the conclusion that the topic has so grown in scope and importance as to merit a comprehensive treatment. The book is the outcome of his attempt to do so in a single monograph.

Numerical Methods in Engineering with Python 3 - Jaan Kiusalaas 2013-01-21

Provides an introduction to numerical methods for students in engineering. It uses Python 3, an easy-to-use, high-level programming language.

Differential Equations - Charles Henry Edwards 2008

This practical book reflects the new technological emphasis that permeates differential equations, including the wide availability of scientific computing environments like Maple, Mathematica, and MATLAB; it does not concentrate on traditional manual methods but rather on new computer-based methods that lead to a wider range of more realistic applications. The book starts and ends with discussions of mathematical modeling of real-world phenomena, evident in figures, examples, problems, and applications throughout the book. For mathematicians and those in the field of computer science and engineering.

Physics of Oscillations and Waves - Inge Vistnes 2018-08-21

In this textbook a combination of standard mathematics and modern numerical methods is used to describe a wide range of natural wave phenomena, such as sound, light and water waves, particularly in specific popular contexts, e.g. colors or the acoustics of musical instruments. It introduces the reader to the basic physical principles that allow the description of the oscillatory motion of matter and classical fields, as well as resulting concepts including interference, diffraction, and coherence. Numerical methods offer new scientific insights and make it possible to handle interesting cases that can't readily be addressed using analytical mathematics; this holds true not only for problem solving but also for the description of phenomena. Essential physical parameters are brought more into focus, rather than concentrating on the details of which mathematical trick should be used to obtain a certain solution. Readers will learn how time-resolved frequency analysis offers a deeper understanding of the interplay between frequency and time, which is relevant to many phenomena involving oscillations and waves. Attention is also drawn to common misconceptions resulting from uncritical use of the Fourier transform. The book offers an ideal guide for upper-level undergraduate physics students and will also benefit physics instructors. Program codes in Matlab and Python, together with interesting files for use in the problems, are provided as free supplementary material.

Differential Equations For Dummies - Steven Holzner 2008-06-03

The fun and easy way to understand and solve complex equations Many of the fundamental laws of physics, chemistry, biology, and economics can be formulated as differential equations. This plain-English guide explores the many applications of this mathematical tool and shows how differential equations can help us understand the world around us. Differential Equations For Dummies is the perfect companion for a college differential equations course and is an ideal supplemental resource for other calculus classes as well as science and engineering courses. It offers step-by-step techniques, practical tips, numerous exercises, and clear, concise examples to help readers improve their differential equation-solving skills and boost their test scores.

Programming for Computations - Python - Svein Linge 2019-10-30

This book is published open access under a CC BY 4.0 license. This book presents computer programming as a key method for solving mathematical problems. This second edition of the well-received book has been extensively revised: All code is now written in Python version 3.6 (no longer version 2.7). In addition, the two first chapters of the previous edition have been extended and split up into five new chapters, thus expanding the introduction to programming from 50 to 150 pages. Throughout the book, the explanations provided are now more detailed, previous examples have been modified, and new sections, examples and exercises have been added. Also, a number of small errors have been corrected. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style employed is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows students to write simple programs for solving common mathematical problems with numerical methods in the context of engineering and science courses. The emphasis is on generic algorithms, clean program design, the use of functions, and automatic tests for verification.

Handbook of Mathematical Functions - Milton Abramowitz

1965-01-01

An extensive summary of mathematical functions that occur in physical and engineering problems

Stellar Interiors - Carl J. Hansen 2012-12-06

That trees should have been cut down to provide paper for this book was an ecological affront. From a book review. - Anthony Blond (in the Spectator, 1983) The first modern text on our subject, Structure and Evolution of the Stars, was published over thirty years ago. In it, Martin Schwarzschild described numerical experiments that successfully reproduced most of the observed properties of the majority of stars seen in the sky. He also set the standard for a lucid description of the physics of stellar interiors. Ten years later, in 1968, John P. Cox's two-volume monograph Principles of Stellar Structure appeared, as did the more specialized text Principles of Stellar Evolution and Nucleosynthesis by Donald D. Clayton and what a difference ten years had made. The field had matured into the basic form that it remains today. The past twenty-plus years have seen this branch of astrophysics flourish and develop into a fundamental pillar of modern astrophysics that addresses an enormous variety of phenomena. In view of this it might seem foolish to offer another text of finite length and expect it to cover any more than a

fraction of what should be discussed to make it a thorough and self-contained reference. Well, it doesn't. Our specific aim is to introduce only the fundamentals of stellar astrophysics. You will find little reference here to black holes, millisecond pulsars, and other "sexy" objects.

Numerical Methods Using Matlab John H. Mathews 2010-08-12

This package consists of the textbook plus MATLAB & Simulink Student Version 2010a For undergraduate Introduction to Numerical Analysis courses in mathematics, science, and engineering departments. This book provides a fundamental introduction to numerical analysis for undergraduate students in the areas of mathematics, computer science, physical sciences, and engineering. Knowledge of calculus is assumed.

Applied Stochastic Differential Equations - Simo Särkkä 2019-05-02
With this hands-on introduction readers will learn what SDEs are all about and how they should use them in practice.

Additive Runge-Kutta Schemes for Convection-diffusion-reaction Equations - Christopher Alan Kennedy 2001

Additive Runge-Kutta (ARK) methods are investigated for application to the spatially discretized one-dimensional convection-diffusion-reaction (CDR) equations. First, accuracy, stability, conservation, and dense output are considered for the general case when N different Runge-Kutta methods are grouped into a single composite method. Then, implicit-explicit, $N=2$, additive Runge-Kutta ARK methods from third- to fifth-order are presented that allow for integration of stiff terms by an L -stable, stiffly-accurate explicit, singly diagonally implicit Runge-Kutta (ESDIRK) method while the nonstiff terms are integrated with a traditional explicit Runge-Kutta method (ERK). Coupling error terms are of equal order to those of the elemental methods. Derived ARK methods have vanishing stability functions for very large values of the stiff scaled eigenvalue and retain high stability efficiency in the absence of stiffness.

A Modern Introduction to Differential Equations - Henry J. Ricardo

2009-02-24

A Modern Introduction to Differential Equations, Second Edition, provides an introduction to the basic concepts of differential equations. The book begins by introducing the basic concepts of differential equations, focusing on the analytical, graphical, and numerical aspects of first-order equations, including slope fields and phase lines. The discussions then cover methods of solving second-order homogeneous and nonhomogeneous linear equations with constant coefficients; systems of linear differential equations; the Laplace transform and its applications to the solution of differential equations and systems of differential equations; and systems of nonlinear equations. Each chapter concludes with a summary of the important concepts in the chapter. Figures and tables are provided within sections to help students visualize or summarize concepts. The book also includes examples and exercises drawn from biology, chemistry, and economics, as well as from traditional pure mathematics, physics, and engineering. This book is designed for undergraduate students majoring in mathematics, the natural sciences, and engineering. However, students in economics, business, and the social sciences with the necessary background will also find the text useful. Student friendly readability- assessible to the average student Early introduction of qualitative and numerical methods Large number of exercises taken from biology, chemistry, economics, physics and engineering Exercises are labeled depending on difficulty/sophistication End of chapter summaries Group projects

Python Programming and Numerical Methods Qingkai Kong 2020-11-27

Python Programming and Numerical Methods: A Guide for Engineers and Scientists introduces programming tools and numerical methods to engineering and science students, with the goal of helping the students to develop good computational problem-solving techniques through the use of numerical methods and the Python programming language. Part One introduces fundamental programming concepts, using simple examples to put new concepts quickly into practice. Part Two covers the fundamentals of algorithms and numerical analysis at a level that allows students to quickly apply results in practical settings. Includes tips, warnings and "try this" features within each chapter to help the reader develop good programming practice Summaries at the end of each chapter allow for quick access to important information Includes code in Jupyter notebook format that can be directly run online

Proceedings of the Army Numerical and Computers Analysis Conference - 1978

Numerical Methods in Engineering and Applied Science - Bruce Irons 1987

