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Encyclopaedia of Mathematics - M. Hazewinkel 2013-12-01

Differential Equations and Linear Algebra - Stephen W. Goode 2014-01-14
This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. For combined differential equations and linear algebra courses teaching students who have successfully completed three semesters of calculus. This complete introduction to both differential equations and linear algebra presents a carefully balanced and sound integration of the two topics. It promotes in-depth understanding rather than rote memorization, enabling students to fully comprehend abstract concepts and leave the course with a solid foundation in linear algebra. Flexible in format, it explains concepts clearly and logically with an abundance of examples and illustrations, without sacrificing level or rigor. A vast array of problems supports the material, with varying levels from which students/instructors can choose.
MATHEMATICAL METHODS IN CHEMICAL ENGINEERING - S. PUSHPAVANAM 1998-01-01
This comprehensive, well organized and easy to read book presents concepts in a unified framework to establish a similarity in the methods of solutions and analysis of such diverse systems as algebraic equations, ordinary differential equations and partial differential equations. The distin-guishing feature of the book is the clear focus on analytical methods of solving equations. The text explains how the methods meant to elucidate linear problems can be extended to analyse nonlinear problems. The book also discusses in detail modern concepts like bifurcation theory and chaos.To attract engineering students to applied mathematics, the author explains the concepts in a clear, concise and straightforward manner, with the help of examples and analysis. The significance of analytical methods and concepts for the engineer/scientist interested in numerical applications is clearly brought out.Intended as a textbook for the postgraduate students in engineering, the book could also be of great help to the research students.
Stability & Periodic Solutions of Ordinary & Functional Differential Equations - T. A. Burton 2014-06-24
This book's discussion of a broad class of differential equations includes linear differential and integrodifferential equations, fixed-point theory, and the basic stability and periodicity theory for nonlinear ordinary and functional differential equations.
Computers in Mathematics - V. Chudnovsky 2020-12-18
Talks from the International Conference on Computers and Mathematics held July 29-Aug. 1, 1986, Stanford U. Some are focused on the past and future roles of computers as a research tool in such areas as number theory, analysis, special functions, combinatorics, algebraic geometry, topology, physics,
Numerical Algebra, Matrix Theory, Differential-Algebraic Equations and

Control Theory - Peter Benner 2015-05-09
This edited volume highlights the scientific contributions of Volker Mehrmann, a leading expert in the area of numerical (linear) algebra, matrix theory, differential-algebraic equations and control theory. These mathematical research areas are strongly related and often occur in the same real-world applications. The main areas where such applications emerge are computational engineering and sciences, but increasingly also social sciences and economics. This book also reflects some of Volker Mehrmann's major career stages. Starting out working in the areas of numerical linear algebra (his first full professorship at TU Chemnitz was in "Numerical Algebra," hence the title of the book) and matrix theory, Volker Mehrmann has made significant contributions to these areas ever since. The highlights of these are discussed in Parts I and II of the present book. Often the development of new algorithms in numerical linear algebra is motivated by problems in system and control theory. These and his later major work on differential-algebraic equations, to which he together with Peter Kunkel made many groundbreaking contributions, are the topic of the chapters in Part III. Besides providing a scientific discussion of Volker Mehrmann's work and its impact on the development of several areas of applied mathematics, the individual chapters stand on their own as reference works for selected topics in the fields of numerical (linear) algebra, matrix theory, differential-algebraic equations and control theory.
Applied Mechanics Reviews - 1972

Differential Equations: A Dynamical Systems Approach - John H. Hubbard 1997-10-17
This corrected third printing retains the authors'main emphasis on ordinary differential equations. It is most appropriate for upper level undergraduate and graduate students in the fields of mathematics, engineering, and applied mathematics, as well as the life sciences, physics and economics. The authors have taken the view that a differential equations theory defines functions; the object of the theory is to understand the behaviour of these functions. The tools the authors use include qualitative and numerical methods besides the traditional analytic methods, and the companion software, MacMath, is designed to bring these notions to life.
Ordinary Differential Equations - W. Cox 1996-01-05
This text provides a sound foundation in the underlying principles of ordinary differential equations. Important concepts are worked through in detail and the student is encouraged to develop much of the routine material themselves.
A First Course in the Numerical Analysis of Differential Equations - A. Iserles 2009
lead the reader to a theoretical understanding of the subject without neglecting its practical aspects. The outcome is a textbook that is mathematically honest and rigorous and provides its target audience with a wide range of skills in both ordinary and partial differential equations." --Book Jacket.
Stability of Solutions of Differential Equations in Banach Space - Ju. L. Daleckii 2002-03-15

Introduction to Partial Differential Equations - Aslak Tveito 2004-10-04
This book teaches basic methods of partial differential equations and introduces related important ideas associated with the analysis of numerical methods for those partial differential equations. Coverage details such topics as separation of variables, Fourier analysis, maximum principles, and energy estimates. The book introduces numerical methods in parallel to the classical theory and also includes many engaging exercises.
Differential Equations and Linear Algebra - Gilbert Strang 2015-02-12
Differential equations and linear algebra are two central topics in the undergraduate mathematics curriculum. This innovative textbook allows the two subjects to be developed either separately or together, illuminating the connections between two fundamental topics, and giving increased flexibility to instructors. It can be used either as a semester-long course in differential equations, or as a one-year course in differential equations, linear algebra, and applications. Beginning with the basics of differential equations, it covers first and second order equations, graphical and numerical methods,

and matrix equations. The book goes on to present the fundamentals of vector spaces, followed by eigenvalues and eigenvectors, positive definiteness, integral transform methods and applications to PDEs. The exposition illuminates the natural correspondence between solution methods for systems of equations in discrete and continuous settings. The topics draw on the physical sciences, engineering and economics, reflecting the author's distinguished career as an applied mathematician and expositor.

PETSc for Partial Differential Equations: Numerical Solutions in C and Python - Ed Bueler 2020-10-22

The Portable, Extensible Toolkit for Scientific Computation (PETSc) is an open-source library of advanced data structures and methods for solving linear and nonlinear equations and for managing discretizations. This book uses these modern numerical tools to demonstrate how to solve nonlinear partial differential equations (PDEs) in parallel. It starts from key mathematical concepts, such as Krylov space methods, preconditioning, multigrid, and Newton’s method. In PETSc these components are composed at run time into fast solvers. Discretizations are introduced from the beginning, with an emphasis on finite difference and finite element methodologies. The example C programs of the first 12 chapters, listed on the inside front cover, solve (mostly) elliptic and parabolic PDE problems. Discretization leads to large, sparse, and generally nonlinear systems of algebraic equations. For such problems, mathematical solver concepts are explained and illustrated through the examples, with sufficient context to speed further development. PETSc for Partial Differential Equations addresses both discretizations and fast solvers for PDEs, emphasizing practice more than theory. Well-structured examples lead to run-time choices that result in high solver performance and parallel scalability. The last two chapters build on the reader’s understanding of fast solver concepts when applying the Firedrake Python finite element solver library. This textbook, the first to cover PETSc programming for nonlinear PDEs, provides an on-ramp for graduate students and researchers to a major area of high-performance computing for science and engineering. It is suitable as a supplement for courses in scientific computing or numerical methods for differential equations.

Computer Literature Bibliography: 1964-1967 - W. W. Youden 1965

Nonlinear Partial Differential Equations in Engineering - W. F. Ames 1965-01-01

Nonlinear Partial Differential Equations in Engineering

Basic Theory of Ordinary Differential Equations - Po-Fang Hsieh 2012-12-06

Providing readers with the very basic knowledge necessary to begin research on differential equations with professional ability, the selection of topics here covers the methods and results that are applicable in a variety of different fields. The book is divided into four parts. The first covers fundamental existence, uniqueness, smoothness with respect to data, and nonuniqueness. The second part describes the basic results concerning linear differential equations, while the third deals with nonlinear equations. In the last part the authors write about the basic results concerning power series solutions. Each chapter begins with a brief discussion of its contents and history, and hints and comments for many problems are given throughout. With 114 illustrations and 206 exercises, the book is suitable for a one-year graduate course, as well as a reference book for research mathematicians.

Handbook of Differential Equations - Daniel Zwillinger 2021-12-31

Through the previous three editions, Handbook of Differential Equations has proven an invaluable reference for anyone working within the field of mathematics, including academics, students, scientists, and professional engineers. The book is a compilation of methods for solving and approximating differential equations. These include the most widely applicable methods for solving and approximating differential equations, as well as numerous methods. Topics include methods for ordinary differential equations, partial differential equations, stochastic differential equations, and systems of such equations. Included for nearly every method are: The types of equations to which the method is applicable The idea behind the method The procedure for carrying out the method At least

one simple example of the method Any cautions that should be exercised Notes for more advanced users The fourth edition includes corrections, many supplied by readers, as well as many new methods and techniques. These new and corrected entries make necessary improvements in this edition. Table of Contents I.A Definitions and Concepts. 1. Definition of Terms. 2. Alternative Theorems. 3. Bifurcation Theory. 4. Chaos in Dynamical Systems. 5. Classification of Partial Differential Equations. 6. Compatible Systems. 7. Conservation Laws. 8. Differential Equations – Diagrams. 9. Differential Equations – Symbols. 10. Differential Resultants. 11. Existence and Uniqueness Theorems. 12. Fixed Point Existence Theorems. 13. Hamilton – Jacobi Theory. 14. Infinite Order Differential Equations. 15. Integrability of Systems. 16. Inverse Problems. 17. Limit Cycles. 18. PDEs & Natural Boundary Conditions. 19. Normal Forms: Near-Identity Transformations. 20. q-Differential Equations. 21. Quaternionic Differential Equations. 22. Self-Adjoint Eigenfunction Problems. 23. Stability Theorems. 24. Stochastic Differential Equations. 25. Sturm–Liouville Theory. 26. Variational Equations. 27. Web Resources. 28. Well-Posed Differential Equations. 29. Wronskians & Fundamental Solutions. 30. Zeros of Solutions. I.B. Transformations. 31. Canonical Forms. 32. Canonical Transformations. 33. Darboux Transformation. 34. An Involutory Transformation. 35. Liouville Transformation – 1. 36. Liouville Transformation – 2. 37. Changing Linear ODEs to a First Order System. 38. Transformations of Second Order Linear ODEs – 1. 39. Transformations of Second Order Linear ODEs – 2. 40. Transforming an ODE to an Integral Equation. 41. Miscellaneous ODE Transformations. 42. Transforming PDEs Generically. 43. Transformations of PDEs. 44. Transforming a PDE to a First Order System. 45. Prüfer Transformation. 46. Modified Prüfer Transformation. II. Exact Analytical Methods. 47. Introduction to Exact Analytical Methods. 48. Look-Up Technique. 49. Look-Up ODE Forms. II.A Exact Methods for ODEs. 50. Use of the Adjoint Equation. 51. An Nth Order Equation. 52. Autonomous Equations – Independent Variable Missing. 53. Bernoulli Equation. 54. Clairaut's Equation. 55. Constant Coefficient Linear ODEs. 56 Contact Transformation. 57. Delay Equations. 58. Dependent Variable Missing. 59. Differentiation Method. 60. Differential Equations with Discontinuities. 61. Eigenfunction Expansions. 62. Equidimensional-in-x Equations. 63. Equidimensional-in-y Equations. 64. Euler Equations. 65. Exact First Order Equations. 66. Exact Second Order Equations. 67. Exact Nth Order Equations. 68. Factoring Equations. 69. Factoring/Composing Operators. 70. Factorization Method. 71. Fokker–Planck Equation. 72. Fractional Differential Equations. 73. Free Boundary Problems. 74. Generating Functions. 75. Green's Functions. 76. ODEs with Homogeneous Functions. 77. Hypergeometric Equation. 78. Method of Images. 79. Integrable Combinations. 80. Integrating Factors*. 81. Interchanging Dependent and Independent Variables. 82. Integral Representation: Laplace's Method. 83. Integral Transforms: Finite Intervals. 84. Integral Transforms: Infinite Intervals. 85. Lagrange's Equation. 86. Lie Algebra Technique. 87. Lie Groups: ODEs. 88. Non-normal Operators. 89. Operational Calculus. 90. Pfaffian Differential Equations. 91. Quasilinear Second Order ODEs. 92. Quasipolynomial ODEs. 93. Reduction of Order. 94. Resolvent Method for Matrix ODEs. 95. Riccati Equation – Matrices. 96. Riccati Equation – Scalars. 97. Scale Invariant Equations. 98. Separable Equations. 99. Series Solution. 100. Equations Solvable for x. 101. Equations Solvable for y. 102. Superposition. 103. Undetermined Coefficients. 104. Variation of Parameters. 105. Vector ODEs. II.B Exact Methods for PDEs. 106. Bäcklund Transformations. 107. Cagniard–de Hoop Method. 108. Method of Characteristics. 109. Characteristic Strip Equations. 110. Conformal Mappings. 111. Method of Descent. 112. Diagonalizable Linear Systems of PDEs. 113. Duhamel's Principle. 114. Exact Partial Differential Equations. 115. Fokas Method / Unified Transform. 116. Hodograph Transformation. 117. Inverse Scattering. 118. Jacobi's Method. 119. Legendre Transformation. 120. Lie Groups: PDEs. 121. Many Consistent PDEs. 122. Poisson Formula. 123. Resolvent Method for PDEs. 124. Riemann's Method 125 Separation of Variables. 126. Separable Equations: Stäckel Matrix. 127. Similarity

Methods. 128. Exact Solutions to the Wave Equation. 129. Wiener–Hopf Technique. III. Approximate Analytical Methods. 130. Introduction to Approximate Analysis. 131. Adomian Decomposition Method. 132. Chaplygin's Method. 133. Collocation. 134. Constrained Functions. 135. Differential Constraints. 136. Dominant Balance. 137. Equation Splitting. 138. Floquet Theory. 139. Graphical Analysis: The Phase Plane. 140 Graphical Analysis: Poincaré Map. 141. Graphical Analysis: Tangent Field. 142. Harmonic Balance. 143. Homogenization. 144. Integral Methods. 145. Interval Analysis. 146. Least Squares Method. 147. Equivalent Linearization and Nonlinearization. 148. Lyapunov Functional. 149. Maximum Principles. 150. McGarvey Iteration Technique. 151. Moment Equations: Closure. 152. Moment Equations: Itô Calculus. 153. Monge's Method 154. Newton's Method. 155. Padé Approximants. 156. Parametrix Method. 157. Perturbation Method: Averaging. 158. Perturbation Method: Boundary Layers. 159. Perturbation Method: Functional Iteration. 160. Perturbation Method: Multiple Scales. 161. Perturbation Method: Regular Perturbation. 162. Perturbation Method: Renormalization Group. 163. Perturbation Method: Strained Coordinates. 164. Picard Iteration. 165. Reversion Method. 166. Singular Solutions. 167. Soliton-Type Solutions. 168. Stochastic Limit Theorems. 169. Structured Guessing. 170. Taylor Series Solutions. 171. Variational Method: Eigenvalue Approximation. 172. Variational Method: Rayleigh–Ritz. 173. WKB Method. IV.A Numerical Methods: Concepts. 174. Introduction to Numerical Methods. 175. Terms for Numerical Methods. 176. Finite Difference Formulas. 177. Finite Difference Methodology. 178. Grid Generation. 179. Richardson Extrapolation. 180. Stability: ODE Approximations. 181. Stability: Courant Criterion. 182. Stability: Von Neumann Test. 183. Testing Differential Equation Routines. IV.B Numerical Methods for ODEs. 184. Analytic Continuation. 185. Boundary Value Problems: Box Method. 186. Boundary Value Problems: Shooting Method. 187. Continuation Method. 188. Continued Fractions. 189. Cosine Method. 190. Differential Algebraic Equations. 191. Eigenvalue/Eigenfunction Problems. 192. Euler's Forward Method. 193. Finite Element Method. 194. Hybrid Computer Methods. 195. Invariant Imbedding. 196. Multigrid Methods. 197. Neural Networks & Optimization. 198. Nonstandard Finite Difference Schemes. 199. ODEs with Highly Oscillatory Terms. 200. Parallel Computer Methods. 201. Predictor–Corrector Methods. 202. Probabilistic Methods. 203. Quantum computing. 204. Runge–Kutta Methods. 205. Stiff Equations. 206. Integrating Stochastic Equations. 207. Symplectic Integration. 208. System Linearization Via Koopman. 209. Using Wavelets. 210. Weighted Residual Methods. IV.C Numerical Methods for PDEs. 211. Boundary Element Method. 212. Differential Quadrature. 213. Domain Decomposition. 214. Elliptic Equations: Finite Differences. 215. Elliptic Equations: Monte–Carlo Method. 216. Elliptic Equations: Relaxation. 217. Hyperbolic Equations: Method of Characteristics. 218. Hyperbolic Equations: Finite Differences. 219. Lattice Gas Dynamics. 220. Method of Lines. 221. Parabolic Equations: Explicit Method. 222. Parabolic Equations: Implicit Method. 223. Parabolic Equations: Monte–Carlo Method. 224. Pseudospectral Method. V. Computer Languages and Systems. 225. Computer Languages and Packages. 226. Julia Programming Language. 227. Maple Computer Algebra System. 228. Mathematica Computer Algebra System. 229. MATLAB Programming Language. 230. Octave Programming Language. 231. Python Programming Language. 232. R Programming Language. 233. Sage Computer Algebra System. Biographies Daniel Zwillinger has more than 35 years of proven technical expertise in numerous areas of engineering and the physical sciences. He earned a Ph.D. in applied mathematics from the California Institute of Technology. He is the Editor of CRC Standard Mathematical Tables and Formulas, 33rd edition and also Table of Integrals, Series, and Products, Gradshteyn and Ryzhik. He serves as the Series Editor on the CRC Series of Advances in Applied Mathematics. Vladimir A. Dobrushkin is a Professor at the Division of Applied Mathematics, Brown University. He holds a Ph.D. in Applied mathematics and Dr.Sc. in mechanical engineering. He is the author of three books for CRC Press, including Applied Differential

Equations: The Primary Course, Applied Differential Equations with Boundary Value Problems, and Methods in Algorithmic Analysis.

Geometric Integrators for Differential Equations with Highly Oscillatory Solutions - Xinyuan Wu 2021-10-29

The idea of structure-preserving algorithms appeared in the 1980's. The new paradigm brought many innovative changes. The new paradigm wanted to identify the long-time behaviour of the solutions or the existence of conservation laws or some other qualitative feature of the dynamics. Another area that has kept growing in importance within Geometric Numerical Integration is the study of highly-oscillatory problems: problems where the solutions are periodic or quasiperiodic and have to be studied in time intervals that include an extremely large number of periods. As is known, these equations cannot be solved efficiently using conventional methods. A further study of novel geometric integrators has become increasingly important in recent years. The objective of this monograph is to explore further geometric integrators for highly oscillatory problems that can be formulated as systems of ordinary and partial differential equations. Facing challenging scientific computational problems, this book presents some new perspectives of the subject matter based on theoretical derivations and mathematical analysis, and provides high-performance numerical simulations. In order to show the long-time numerical behaviour of the simulation, all the integrators presented in this monograph have been tested and verified on highly oscillatory systems from a wide range of applications in the field of science and engineering. They are more efficient than existing schemes in the literature for differential equations that have highly oscillatory solutions. This book is useful to researchers, teachers, students and engineers who are interested in Geometric Integrators and their long-time behaviour analysis for differential equations with highly oscillatory solutions.

Partial Differential Equations with Minimal Smoothness and Applications - B. Dahlberg 2012-12-06

In recent years there has been a great deal of activity in both the theoretical and applied aspects of partial differential equations, with emphasis on realistic engineering applications, which usually involve lack of smoothness. On March 21-25, 1990, the University of Chicago hosted a workshop that brought together approximately fortyfive experts in theoretical and applied aspects of these subjects. The workshop was a vehicle for summarizing the current status of research in these areas, and for defining new directions for future progress - this volume contains articles from participants of the workshop.

Differential Equations with Linear Algebra - Matthew R. Boelkins 2009-11-05

Differential Equations with Linear Algebra explores the interplay between linear algebra and differential equations by examining fundamental problems in elementary differential equations. With an example-first style, the text is accessible to students who have completed multivariable calculus and is appropriate for courses in mathematics and engineering that study systems of differential equations.

Applied Linear Algebra - Peter J. Olver 2018-05-30

This textbook develops the essential tools of linear algebra, with the goal of imparting technique alongside contextual understanding. Applications go hand-in-hand with theory, each reinforcing and explaining the other. This approach encourages students to develop not only the technical proficiency needed to go on to further study, but an appreciation for when, why, and how the tools of linear algebra can be used across modern applied mathematics. Providing an extensive treatment of essential topics such as Gaussian elimination, inner products and norms, and eigenvalues and singular values, this text can be used for an in-depth first course, or an application-driven second course in linear algebra. In this second edition, applications have been updated and expanded to include numerical methods, dynamical systems, data analysis, and signal processing, while the pedagogical flow of the core material has been improved. Throughout, the text emphasizes the conceptual connections between each application and the underlying linear algebraic techniques, thereby enabling students not only to learn how to apply the mathematical tools in routine contexts, but also

to understand what is required to adapt to unusual or emerging problems. No previous knowledge of linear algebra is needed to approach this text, with single-variable calculus as the only formal prerequisite. However, the reader will need to draw upon some mathematical maturity to engage in the increasing abstraction inherent to the subject. Once equipped with the main tools and concepts from this book, students will be prepared for further study in differential equations, numerical analysis, data science and statistics, and a broad range of applications. The first author's text, Introduction to Partial Differential Equations, is an ideal companion volume, forming a natural extension of the linear mathematical methods developed here.

An Introduction to Differential Equations and Their Applications - Stanley J. Farlow 2006-03-11
This introductory text explores 1st- and 2nd-order differential equations, series solutions, the Laplace transform, difference equations, much more. Numerous figures, problems with solutions, notes. 1994 edition. Includes 268 figures and 23 tables.

Numerical Analysis of Partial Differential Equations - S. H, Lui 2012-01-10
A balanced guide to the essential techniques for solving elliptic partial differential equations Numerical Analysis of Partial Differential Equations provides a comprehensive, self-contained treatment of the quantitative methods used to solve elliptic partial differential equations (PDEs), with a focus on the efficiency as well as the error of the presented methods. The author utilizes coverage of theoretical PDEs, along with the nu merical solution of linear systems and various examples and exercises, to supply readers with an introduction to the essential concepts in the numerical analysis of PDEs. The book presents the three main discretization methods of elliptic PDEs: finite difference, finite elements, and spectral methods. Each topic has its own devoted chapters and is discussed alongside additional key topics, including: The mathematical theory of elliptic PDEs Numerical linear algebra Time-dependent PDEs Multigrid and domain decomposition PDEs posed on infinite domains The book concludes with a discussion of the methods for nonlinear problems, such as Newton's method, and addresses the importance of hands-on work to facilitate learning. Each chapter concludes with a set of exercises, including theoretical and programming problems, that allows readers to test their understanding of the presented theories and techniques. In addition, the book discusses important nonlinear problems in many fields of science and engineering, providing information as to how they can serve as computing projects across various disciplines. Requiring only a preliminary understanding of analysis, Numerical Analysis of Partial Differential Equations is suitable for courses on numerical PDEs at the upper-undergraduate and graduate levels. The book is also appropriate for students majoring in the mathematical sciences and engineering.

Differential Equations and Applications - Yeol Je Cho 2007-07-02
Preface; Existence for set Differential Equations via Multivalued Operator Equations; Nonlocal Cauchy Problem for Abstract Functional Integrodifferential Equations; Existence Results for Discontinuous Functional Evolution Equations in Abstract Spaces; A Generalised Solution of the Black-Scholes Partial Differential Equation; Optimality and Duality for Multiobjective Fractional Programming with Generalised Invexity; Markovian Approach to the Backward Recurrence Time; A Multiplicity Result of Singular Boundary Value Problems for Second Order Impulsive Differential Equations; Extremal Solutions of Initial Value Problem for Non-linear Second Order Impulsive Integro-Differential Equations of Volterra Type in Banach Spaces; Construction of Upper and Lower Solutions for Singular p-Laplacian Equations with Sign Changing Nonlinearities; A Qualitative Hamiltonian Model for Human Motion; ; Newton's Method for Matrix Polynomials; Admissibility and Non-Uniform Dichotomy for Differential Systems; Boundary Value Problems of Fuzzy Differential Equations on an Infinite Interval; An Ultimate Boundedness Result for a Certain System of Fourth Order Non-linear Differential Equations; The Initial Value Problems for the First Order System of Non-linear Impulsive Integro-Differential Equations; Generic Well-Posedness of Nonconvex Optimal Control Problems; Index.

NBS Special Publication - 1968

Applied and Industrial Mathematics in Italy -

Encyclopaedia of Mathematics - Michiel Hazewinkel 2012-12-06
This ENCYCLOPAEDIA OF MATHEMATICS aims to be a reference work for all parts of mathema tics. It is a translation with updates and editorial comments of the Soviet Mathematical Encyclo paedia published by 'Soviet Encyclopaedia Publishing House' in five volumes in 1977 - 1985. The annotated translation consists of ten volumes including a special index volume. There are three kinds of articles in this ENCYCLOPAEDIA. First of all there are survey-type articles dealing with the various main directions in mathematics (where a rather fine subdivision has been used). The main requirement for these articles has been that they should give a reason ably complete up-to-date account of the current state of affairs in these areas and that they should be maximally accessible. On the whole, these articles should be understandable to mathematics students in their first specialization years, to graduates from other mathematical areas and, depending on the specific subject, to specialists in other domains of science, en gineers and teachers of mathematics. These articles treat their material at a fairly general level and aim to give an idea of the kind of problems, techniques and concepts involved in the area in question. They also contain background and motivation rather than precise statements of pre cise theorems with detailed definitions and technical details on how to carry out proofs and con structions.

Differential Equations - C. M. Dafermos 2020-08-26
This volume is an outcome of the EQUADIFF 87 conference in Greece. It addresses a wide spectrum of topics in the theory and applications of differential equations, ordinary, partial, and functional. The book is intended for mathematics and scientists.

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).

Ordinary Differential Equations with Linear Algebra - David Lomen 1986

Numerical Methods for Partial Differential

Equations - William F. Ames 2014-06-28
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. 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. 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

Guaranteed Estimation Problems in the Theory of Linear Ordinary Differential Equations with Uncertain Data - Oleksandr Nakonechnyi 2022-09-01
This monograph is devoted to the construction of optimal estimates of values of linear functionals on solutions to Cauchy and two-point boundary value problems for systems of linear first-order ordinary differential equations, from indirect observations which are linear transformations of the same solutions perturbed by additive random noises. It is assumed that right-hand sides of equations and boundary data as well as statistical characteristics of random noises in observations are not known and belong to certain given sets in corresponding functional spaces. This leads to the necessity of introducing the minimax statement of an estimation problem when optimal estimates are defined as linear, with respect to observations, estimates for which the maximum of mean square error of estimation taken over the above-mentioned sets attains minimal value. Such estimates are called minimax or guaranteed estimates. It is established that these estimates are expressed explicitly via solutions to some uniquely solvable linear systems of ordinary differential equations of the special type. The authors apply these results for obtaining the optimal estimates of solutions from indirect noisy observations. Similar estimation problems for solutions of boundary value problems for linear differential equations of order n with general boundary conditions are considered. The authors also elaborate guaranteed estimation methods under incomplete data of unknown right-hand sides of equations and boundary data and obtain representations for the corresponding guaranteed estimates. In all the cases estimation errors are determined.

Fluid Flow in Fractured Porous Media - Richeng Liu 2019-09-30
The fluid flow in fracture porous media plays a significant role in the assessment of deep underground reservoirs, such as through CO2 sequestration, enhanced oil recovery, and geothermal energy development. Many methods have been employed—from laboratory experimentation to theoretical analysis and numerical simulations—and allowed for many useful conclusions. This Special Issue aims to report on the current advances related to this topic. This collection of 58 papers represents a wide variety of topics, including on granite permeability investigation, grouting, coal mining, roadway, and concrete, to name but a few. We sincerely hope that the papers published in this Special Issue will be an invaluable resource for our readers.

Differential Equations & Linear Algebra - Charles Henry Edwards 2010
For courses in Differential Equations and Linear Algebra. Acclaimed authors Edwards and Penney combine core topics in elementary differential equations with those concepts and methods of elementary linear algebra needed for a contemporary combined introduction to differential equations and linear algebra. Known for its real-world applications and its blend of algebraic and geometric approaches, this text discusses mathematical modeling of real-world phenomena, with a fresh new computational and

qualitative flavor evident throughout in figures, examples, problems, and applications. In the Third Edition, new graphics and narrative have been added as needed-yet the proven chapter and section structure remains unchanged, so that class notes and syllabi will not require revision for the new edition.

Partial Differential Equations - Walter A. Strauss 2007-12-21

Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

Generalized Inverses - Adi Ben-Israel 2006-04-18

This second edition accounts for many major developments in generalized inverses while maintaining the informal and leisurely style of the 1974 first edition. Added material includes a chapter on applications, new exercises, and an appendix on the work of E.H. Moore.

Ordinary and Partial Differential Equations - Victor Henner 2013-01-29

Covers ODEs and PDEs-in One TextbookUntil now, a comprehensive textbook covering both ordinary differential equations (ODEs) and partial differential equations (PDEs) didn't exist. Fulfilling this need, Ordinary and Partial Differential Equations provides a complete and accessible course on ODEs and PDEs using many examples and exercises as well as

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Designed to introduce students to the theory and applications of differential equations and to help them formulate scientific problems in terms of such equations, this undergraduate-level text emphasizes applications to problems in biology, economics, engineering, and physics. This edition also includes material on discontinuous solutions, Riccati and Euler equations, and linear difference equations.

Solving Direct and Inverse Heat Conduction Problems - Jan Taler 2010-04-16

This book presents a solution for direct and inverse heat conduction problems, discussing the theoretical basis for the heat transfer process and presenting selected theoretical and numerical problems in the form of exercises with solutions. The book covers one-, two- and three dimensional problems which are solved by using exact and approximate analytical methods and numerical methods. An accompanying CD-Rom includes computational solutions of the examples and extensive FORTRAN code.