

# Partial Differential Equations Solution

Numerical Solution of Partial Differential Equations  
Dynamical Systems  
Applications of Lie's Theory of Ordinary and Partial Differential Equations  
Partial Differential Equations  
Applied Partial Differential Equations  
Linear Partial Differential Equations for Scientists and Engineers  
Student Solutions Manual, Partial Differential Equations & Boundary Value Problems with Maple  
Parallel Solution of Partial Differential Equations  
Applied Partial Differential Equations with Fourier Series and Boundary Value Problems (Classic Version)  
Numerical Solution of Partial Differential Equations  
Basic Partial Differential Equation Solutions  
Partial Differential Equations  
Solutions Manual to Accompany Beginning Partial Differential Equations  
Solutions to Differential Equations  
Stable Solutions of Elliptic Partial Differential Equations  
Partial Differential Equations and Boundary-value Problems with Applications  
ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  
Numerical Solution of Partial Differential Equations by the Finite Element Method  
A First Course in Partial Differential Equations  
Solution Techniques for Elementary Partial Differential Equations, Second Edition  
Partial Differential Equations  
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Ordinary and Partial Differential Equations  
Some Classes of Partial Differential Equations  
Solution Manual for Partial Differential Equations for Scientists and Engineers  
Ordinary and Partial Differential Equations  
Boundary Value Problems and Partial

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Differential Equations Stability of Solutions of Integrable Partial Differential Equations Applied Partial Differential Equations Solutions of Partial Differential Equations Partial Differential Equations Student Solutions Manual, Boundary Value Problems Student Solutions Manual to accompany Partial Differential Equations: An Introduction, 2e The Numerical Solution of Ordinary and Partial Differential Equations Numerical Solution of Ordinary and Partial Differential Equations Numerical Solutions of Partial Differential Equations Numerical Solutions of Partial Differential Equations The Numerical Solution of Ordinary and Partial Differential Equations Numerical Solution of Partial Differential Equations Partial Differential Equations: Graduate Level Problems and Solutions

## **Numerical Solution of Partial Differential Equations**

This revised and updated text, now in its second edition, continues to present the theoretical concepts of methods of solutions of ordinary and partial differential equations. It equips students with the various tools and techniques to model different physical problems using such equations. The book discusses the basic concepts of ordinary and partial differential equations. It contains different methods of solving ordinary differential equations of first order and higher degree. It gives the solution methodology for linear differential equations with constant and variable coefficients and linear differential equations

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of second order. The text elaborates simultaneous linear differential equations, total differential equations, and partial differential equations along with the series solution of second order linear differential equations. It also covers Bessel's and Legendre's equations and functions, and the Laplace transform. Finally, the book revisits partial differential equations to solve the Laplace equation, wave equation and diffusion equation, and discusses the methods to solve partial differential equations using the Fourier transform. A large number of solved examples as well as exercises at the end of chapters help the students comprehend and strengthen the underlying concepts. The book is intended for undergraduate and postgraduate students of Mathematics (B.A./B.Sc., M.A./M.Sc.), and undergraduate students of all branches of engineering (B.E./B.Tech.), as part of their course in Engineering Mathematics. New to the SECOND Edition

- Includes new sections and subsections such as applications of differential equations, special substitution (Lagrange and Riccati), solutions of non-linear equations which are exact, method of variation of parameters for linear equations of order higher than two, and method of undetermined coefficients
- Incorporates several worked-out examples and exercises with their answers
- Contains a new Chapter 19 on 'Z-Transforms and its Applications'.

### **Dynamical Systems**

Student Solutions Manual, Boundary Value Problems

## **Applications of Lie's Theory of Ordinary and Partial Differential Equations**

Student Solutions Manual, Partial Differential Equations & Boundary Value Problems with Maple

### **Partial Differential Equations**

Modern and systematic treatment of main approaches; Several additions have been made to the German edition, most notably coverage of eigenvalues and expansions; Emphasis on methods relevant for both linear and nonlinear equations; Contains chapter summaries, detailed illustrations and numerous exercises

### **Applied Partial Differential Equations**

Numerical Solution of Ordinary and Partial Differential Equations is based on a summer school held in Oxford in August-September 1961. The book is organized into four parts. The first three cover the numerical solution of ordinary differential equations, integral equations, and partial differential equations of quasi-linear form. Most of the techniques are evaluated from the standpoints of accuracy, convergence, and stability (in the various senses of these terms) as well as ease of coding and convenience of machine computation. The last part, on practical problems, uses and develops the techniques for the treatment of problems of the greatest difficulty and complexity, which tax not only the best machines but also the best brains. This book was written for scientists who

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have problems to solve, and who want to know what methods exist, why and in what circumstances some are better than others, and how to adapt and develop techniques for new problems. The budding numerical analyst should also benefit from this book, and should find some topics for valuable research. The first three parts, in fact, could be used not only by practical men but also by students, though a preliminary elementary course would assist the reading.

### **Linear Partial Differential Equations for Scientists and Engineers**

Complete solutions for all problems contained in a widely used text for advanced undergraduates in mathematics. Covers diffusion-type problems, hyperbolic-type problems, elliptic-type problems, and numerical and approximate methods. 2016 edition.

### **Student Solutions Manual, Partial Differential Equations & Boundary Value Problems with Maple**

Practice partial differential equations with this student solutions manual Corresponding chapter-by-chapter with Walter Strauss's Partial Differential Equations, this student solutions manual consists of the answer key to each of the practice problems in the instructional text. Students will follow along through each of the chapters, providing practice for areas of study including waves and diffusions, reflections and sources, boundary problems, Fourier series, harmonic functions, and more. Coupled with Strauss's text, this

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solutions manual provides a complete resource for learning and practicing partial differential equations.

### **Parallel Solution of Partial Differential Equations**

An accessible introduction to the finite element method for solving numeric problems, this volume offers the keys to an important technique in computational mathematics. Suitable for advanced undergraduate and graduate courses, it outlines clear connections with applications and considers numerous examples from a variety of science- and engineering-related specialties. This text encompasses all varieties of the basic linear partial differential equations, including elliptic, parabolic and hyperbolic problems, as well as stationary and time-dependent problems. Additional topics include finite element methods for integral equations, an introduction to nonlinear problems, and considerations of unique developments of finite element techniques related to parabolic problems, including methods for automatic time step control. The relevant mathematics are expressed in non-technical terms whenever possible, in the interests of keeping the treatment accessible to a majority of students.

### **Applied Partial Differential Equations with Fourier Series and Boundary Value Problems (Classic Version)**

### **Numerical Solution of Partial Differential**

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## Equations

Partial Differential Equations: Graduate Level Problems and Solutions By Igor Yanovsky

## Basic Partial Differential Equation Solutions

This title is part of the Pearson Modern Classics series. Pearson Modern Classics are acclaimed titles at a value price. Please visit [www.pearsonhighered.com/math-classics-series](http://www.pearsonhighered.com/math-classics-series) for a complete list of titles. Applied Partial Differential Equations with Fourier Series and Boundary Value Problems emphasizes the physical interpretation of mathematical solutions and introduces applied mathematics while presenting differential equations. Coverage includes Fourier series, orthogonal functions, boundary value problems, Green's functions, and transform methods. This text is ideal for readers interested in science, engineering, and applied mathematics.

## Partial Differential Equations

"This second edition contains new and additional exercises, and it includes a new chapter on the applications of PDEs to biology: age structured models, pattern formation, epidemic wave fronts, and advection-diffusion processes. The student who reads through this book and solves many of the exercises will have a sound knowledge base for upper division mathematics, science, and engineering courses where

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detailed models and applications are introduced."--BOOK JACKET.

### **Solutions Manual to Accompany Beginning Partial Differential Equations**

This book presents some of the latest developments in numerical analysis and scientific computing. Specifically, it covers central schemes, error estimates for discontinuous Galerkin methods, and the use of wavelets in scientific computing.

### **Solutions to Differential Equations**

Offering a welcome balance between rigor and ease of comprehension, this book presents full coverage of the analytic (and accurate) method for solving PDEs -- in a manner that is both decipherable to engineers and physically insightful for mathematicians. By exploring the eigenfunction expansion method based on physical principles instead of abstract analyses, it makes the analytic approach understandable, visualizable, and straightforward to implement. Contains tabulations and derivations of all known eigenfunction expansions. Offers demystifying coverage of the separation of variables technique and presents a novel approach to FFT and its utilization. Presents a fast, automatic algorithmic procedure for solving wave, heat, and Laplace equation in rectangular, cylindrical, and spherical coordinates. Discusses Sturm-Liouville Theory; Green's functions and transform methods; and perturbation methods, small wave analysis, and dispersion laws. Motivates



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every technique presented --without exception -- by a heuristic discussion demonstrating the plausibility or inevitability of the procedure, and includes an abundance of figures and worked-out examples. For engineers, applied mathematicians, computer specialists, and analysts.

### **Stable Solutions of Elliptic Partial Differential Equations**

This book presents methods for the computational solution of differential equations, both ordinary and partial, time-dependent and steady-state. Finite difference methods are introduced and analyzed in the first four chapters, and finite element methods are studied in chapter five. A very general-purpose and widely-used finite element program, PDE2D, which implements many of the methods studied in the earlier chapters, is presented and documented in Appendix A. The book contains the relevant theory and error analysis for most of the methods studied, but also emphasizes the practical aspects involved in implementing the methods. Students using this book will actually see and write programs (FORTRAN or MATLAB) for solving ordinary and partial differential equations, using both finite differences and finite elements. In addition, they will be able to solve very difficult partial differential equations using the software PDE2D, presented in Appendix A. PDE2D solves very general steady-state, time-dependent and eigenvalue PDE systems, in 1D intervals, general 2D regions, and a wide range of simple 3D regions.

Contents:Direct Solution of Linear SystemsInitial

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Value Ordinary Differential Equations  
The Initial Value Diffusion Problem  
The Initial Value Transport and Wave Problems  
Boundary Value Problems  
The Finite Element Methods  
Appendix A — Solving PDEs with PDE2D  
Appendix B — The Fourier Stability Method  
Appendix C — MATLAB Programs  
Appendix D — Answers to Selected Exercises

Readership: Undergraduate, graduate students and researchers.

Key Features: The discussion of stability, absolute stability and stiffness in Chapter 1 is clearer than in other texts. Students will actually learn to write programs solving a range of simple PDEs using the finite element method in chapter 5. In Appendix A, students will be able to solve quite difficult PDEs, using the author's software package, PDE2D. (a free version is available which solves small to moderate sized problems)

Keywords: Differential

Equations; Partial Differential Equations; Finite Element Method; Finite Difference Method; Computational Science; Numerical Analysis

Reviews: "This book is very well written and it is relatively easy to read. The presentation is clear and straightforward but quite rigorous. This book is suitable for a course on the numerical solution of ODEs and PDEs problems, designed for senior level undergraduate or beginning level graduate students. The numerical techniques for solving problems presented in the book may also be useful for experienced researchers and practitioners both from universities or industry." Andrzej Icha Pomeranian Academy in Słupsk Poland

## **Partial Differential Equations and Boundary-value Problems with**

## **Applications**

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.

## **ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

This student solutions manual accompanies the text, Boundary Value Problems and Partial Differential Equations, 5e. The SSM is available in print via PDF or

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electronically, and provides the student with the detailed solutions of the odd-numbered problems contained throughout the book. Provides students with exercises that skillfully illustrate the techniques used in the text to solve science and engineering problems Nearly 900 exercises ranging in difficulty from basic drills to advanced problem-solving exercises Many exercises based on current engineering applications

### **Numerical Solution of Partial Differential Equations by the Finite Element Method**

### **A First Course in Partial Differential Equations**

Solution Techniques for Elementary Partial Differential Equations, Third Edition remains a top choice for a standard, undergraduate-level course on partial differential equations (PDEs). Making the text even more user-friendly, this third edition covers important and widely used methods for solving PDEs. New to the Third Edition New sections on the series expansion of more general functions, other problems of general second-order linear equations, vibrating string with other types of boundary conditions, and equilibrium temperature in an infinite strip Reorganized sections that make it easier for students and professors to navigate the contents Rearranged exercises that are now at the end of each section/subsection instead of at the end of the chapter New and improved exercises and worked examples A brief Mathematica® program

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for nearly all of the worked examples, showing students how to verify results by computer This bestselling, highly praised textbook uses a streamlined, direct approach to develop students' competence in solving PDEs. It offers concise, easily understood explanations and worked examples that allow students to see the techniques in action.

### **Solution Techniques for Elementary Partial Differential Equations, Second Edition**

This second edition of a highly successful graduate text presents a complete introduction to partial differential equations and numerical analysis. Revised to include new sections on finite volume methods, modified equation analysis, and multigrid and conjugate gradient methods, the second edition brings the reader up-to-date with the latest theoretical and industrial developments. First Edition Hb (1995): 0-521-41855-0 First Edition Pb (1995): 0-521-42922-6

### **Partial Differential Equations**

### **Solution Techniques for Elementary Partial Differential Equations**

This IMA Volume in Mathematics and its Applications PARALLEL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS is based on the proceedings of a workshop with the same title. The work shop was an

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integral part of the 1996-97 IMA program on "MATHEMATICS IN HIGH-PERFORMANCE COMPUTING." I would like to thank Petter Bjørstad of the Institutt for Informatikk, University of Bergen and Mitchell Luskin of the School of Mathematics, University of Minnesota for their excellent work as organizers of the meeting and for editing the proceedings. I also take this opportunity to thank the National Science Foundation (NSF), Department of Energy (DOE), and the Army Research Office (ARO), whose financial support made the workshop possible.

Willard Miller, Jr., Professor and Director

**PREFACE**

The numerical solution of partial differential equations has been of major importance to the development of many technologies and has been the target of much of the development of parallel computer hardware and software. Parallel computers offer the promise of greatly increased performance and the routine calculation of previously intractable problems. The papers in this volume were presented at the IMA workshop on the Parallel Solution of PDE held during June 9-13, 1997. The workshop brought together leading numerical analysts, computer scientists, and engineers to assess the state-of-the-art and to consider future directions.

## **Ordinary and Partial Differential Equations**

Incorporating a number of enhancements, *Solution Techniques for Elementary Partial Differential Equations, Second Edition* presents some of the most important and widely used methods for solving partial

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differential equations (PDEs). The techniques covered include separation of variables, method of characteristics, eigenfunction expansion, Fourier and Laplace transformations, Green's functions, perturbation methods, and asymptotic analysis. New to the Second Edition New sections on Cauchy–Euler equations, Bessel functions, Legendre polynomials, and spherical harmonics A new chapter on complex variable methods and systems of PDEs Additional mathematical models based on PDEs Examples that show how the methods of separation of variables and eigenfunction expansion work for equations other than heat, wave, and Laplace Supplementary applications of Fourier transformations The application of the method of characteristics to more general hyperbolic equations Expanded tables of Fourier and Laplace transforms in the appendix Many more examples and nearly four times as many exercises This edition continues to provide a streamlined, direct approach to developing students' competence in solving PDEs. It offers concise, easily understood explanations and worked examples that enable students to see the techniques in action. Available for qualifying instructors, the accompanying solutions manual includes full solutions to the exercises. Instructors can obtain a set of template questions for test/exam papers as well as computer-linked projector files directly from the author.

### **Some Classes of Partial Differential Equations**

This is the 2005 second edition of a highly successful

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and well-respected textbook on the numerical techniques used to solve partial differential equations arising from mathematical models in science, engineering and other fields. The authors maintain an emphasis on finite difference methods for simple but representative examples of parabolic, hyperbolic and elliptic equations from the first edition. However this is augmented by new sections on finite volume methods, modified equation analysis, symplectic integration schemes, convection-diffusion problems, multigrid, and conjugate gradient methods; and several sections, including that on the energy method of analysis, have been extensively rewritten to reflect modern developments. Already an excellent choice for students and teachers in mathematics, engineering and computer science departments, the revised text includes more latest theoretical and industrial developments.

### **Solution Manual for Partial Differential Equations for Scientists and Engineers**

This significantly expanded fourth edition is designed as an introduction to the theory and applications of linear PDEs. The authors provide fundamental concepts, underlying principles, a wide range of applications, and various methods of solutions to PDEs. In addition to essential standard material on the subject, the book contains new material that is not usually covered in similar texts and reference books. It also contains a large number of worked examples and exercises dealing with problems in fluid mechanics, gas dynamics, optics, plasma physics,



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elasticity, biology, and chemistry; solutions are provided.

### **Ordinary and Partial Differential Equations**

Lie's group theory of differential equations unifies the many ad hoc methods known for solving differential equations and provides powerful new ways to find solutions. The theory has applications to both ordinary and partial differential equations and is not restricted to linear equations. Applications of Lie's Theory of Ordinary and Partial Differential Equations provides a concise, simple introduction to the application of Lie's theory to the solution of differential equations. The author emphasizes clarity and immediacy of understanding rather than encyclopedic completeness, rigor, and generality. This enables readers to quickly grasp the essentials and start applying the methods to find solutions. The book includes worked examples and problems from a wide range of scientific and engineering fields.

### **Boundary Value Problems and Partial Differential Equations**

Stability analysis for solutions of partial differential equations (PDEs) is important for determining the applicability of a model to the physical world. Establishing stability for PDE solutions is often significantly more challenging than for ordinary differential equation solutions. This task becomes tractable for PDEs possessing a Lax pair. In this

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dissertation, I provide a general framework for computing large parts of the Lax spectrum for periodic and quasiperiodic solutions of a general class of PDEs possessing a Lax pair. This class consists of the AKNS hierarchy admitting a common reduction and generalizations. I then relate the Lax spectrum to the stability spectrum using the squared-eigenfunction connection. Using this, I demonstrate that the subset of the real line which is part of the Lax spectrum maps to stable elements of the linearization. Several examples that demonstrate the direct applicability of this work are provided. One example is worked out in detail: the stability analysis for the elliptic solutions of the focusing nonlinear Schrödinger (NLS) equation. For the NLS equation, I go further by establishing orbital stability of the elliptic solutions with respect to a class of perturbations of integer multiples of the period of the solution.

### **Stability of Solutions of Integrable Partial Differential Equations**

There has been a considerable progress made during the recent past on mathematical techniques for studying dynamical systems that arise in science and engineering. This progress has been, to a large extent, due to our increasing ability to mathematically model physical processes and to analyze and solve them, both analytically and numerically. With its eleven chapters, this book brings together important contributions from renowned international researchers to provide an excellent survey of recent

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advances in dynamical systems theory and applications. The first section consists of seven chapters that focus on analytical techniques, while the next section is composed of four chapters that center on computational techniques.

### **Applied Partial Differential Equations**

Superb introduction devotes almost half its pages to numerical methods for solving partial differential equations, while the heart of the book focuses on boundary-value and initial-boundary-value problems on spatially bounded and on unbounded domains; integral transforms; uniqueness and continuous dependence on data, first-order equations, and more. Numerous exercises included, with solutions for many at end of book. For students with little background in linear algebra, a useful appendix covers that subject briefly.

### **Solutions of Partial Differential Equations**

### **Partial Differential Equations**

Solutions Manual to Accompany Beginning Partial Differential Equations, 3rd Edition Featuring a challenging, yet accessible, introduction to partial differential equations, Beginning Partial Differential Equations provides a solid introduction to partial differential equations, particularly methods of solution based on characteristics, separation of variables, as

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well as Fourier series, integrals, and transforms. Thoroughly updated with novel applications, such as Poe's pendulum and Kepler's problem in astronomy, this third edition is updated to include the latest version of Maples, which is integrated throughout the text. New topical coverage includes novel applications, such as Poe's pendulum and Kepler's problem in astronomy.

### **Student Solutions Manual, Boundary Value Problems**

A systematic examination of classical and non-classical problems for linear partial differential equations and systems of elliptic, hyperbolic and mixed types. Among a number of difficult problems addressed are the Dirichlet and oblique derivative problems for non-uniformly elliptic equations and non-strongly elliptic systems and the Cauchy and Darloux problems for non-strongly hyperbolic systems and hyperbolic equations with parabolic degeneracy on the boundary. Written at a level suitable for undergraduate and graduate students and researchers. Individual price, \$89. Annotation copyrighted by Book News, Inc., Portland, OR

### **Student Solutions Manual to accompany Partial Differential Equations: An Introduction, 2e**

The purpose of this book is to present some new methods in the treatment of partial differential equations. Some of these methods lead to effective

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numerical algorithms when combined with the digital computer. Also presented is a useful chapter on Green's functions which generalizes, after an introduction, to new methods of obtaining Green's functions for partial differential operators. Finally some very new material is presented on solving partial differential equations by Adomian's decomposition methodology. This method can yield realistic computable solutions for linear or non linear cases even for strong nonlinearities, and also for deterministic or stochastic cases - again even if strong stochasticity is involved. Some interesting examples are discussed here and are to be followed by a book dealing with frontier applications in physics and engineering. In Chapter I, it is shown that a use of positive operators can lead to monotone convergence for various classes of nonlinear partial differential equations. In Chapter II, the utility of conservation technique is shown. These techniques are suggested by physical principles. In Chapter III, it is shown that dynamic programming applied to variational problems leads to interesting classes of nonlinear partial differential equations. In Chapter IV, this is investigated in greater detail. In Chapter V, we show that the use of a transformation suggested by dynamic programming leads to a new method of successive approximations.

### **The Numerical Solution of Ordinary and Partial Differential Equations**

Covers ODEs and PDEs—in One Textbook Until now, a comprehensive textbook covering both ordinary

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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 intuitive, easy-to-use software. Teaches the Key Topics in Differential Equations The text includes all the topics that form the core of a modern undergraduate or beginning graduate course in differential equations. It also discusses other optional but important topics such as integral equations, Fourier series, and special functions. Numerous carefully chosen examples offer practical guidance on the concepts and techniques. Guides Students through the Problem-Solving Process Requiring no user programming, the accompanying computer software allows students to fully investigate problems, thus enabling a deeper study into the role of boundary and initial conditions, the dependence of the solution on the parameters, the accuracy of the solution, the speed of a series convergence, and related questions. The ODE module compares students' analytical solutions to the results of computations while the PDE module demonstrates the sequence of all necessary analytical solution steps.

### **Numerical Solution of Ordinary and Partial Differential Equations**

Building on the basic techniques of separation of variables and Fourier series, the book presents the solution of boundary-value problems for basic partial differential equations: the heat equation, wave

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equation, and Laplace equation, considered in various standard coordinate systems--rectangular, cylindrical, and spherical. Each of the equations is derived in the three-dimensional context; the solutions are organized according to the geometry of the coordinate system, which makes the mathematics especially transparent. Bessel and Legendre functions are studied and used whenever appropriate throughout the text. The notions of steady-state solution of closely related stationary solutions are developed for the heat equation; applications to the study of heat flow in the earth are presented. The problem of the vibrating string is studied in detail both in the Fourier transform setting and from the viewpoint of the explicit representation (d'Alembert formula). Additional chapters include the numerical analysis of solutions and the method of Green's functions for solutions of partial differential equations. The exposition also includes asymptotic methods (Laplace transform and stationary phase). With more than 200 working examples and 700 exercises (more than 450 with answers), the book is suitable for an undergraduate course in partial differential equations.

### **Numerical Solutions of Partial Differential Equations**

In this undergraduate/graduate textbook, the authors introduce ODEs and PDEs through 50 class-tested lectures. Mathematical concepts are explained with clarity and rigor, using fully worked-out examples and helpful illustrations. Exercises are provided at the end of each chapter for practice. The treatment of ODEs is

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developed in conjunction with PDEs and is aimed mainly towards applications. The book covers important applications-oriented topics such as solutions of ODEs in form of power series, special functions, Bessel functions, hypergeometric functions, orthogonal functions and polynomials, Legendre, Chebyshev, Hermite, and Laguerre polynomials, theory of Fourier series. Undergraduate and graduate students in mathematics, physics and engineering will benefit from this book. The book assumes familiarity with calculus.

### **Numerical Solutions of Partial Differential Equations**

Resources for instructors who adopt this textbook: Lecture Slides | Instructors' Manual (complete solutions and supporting work) | Students' Manual (final answers to computational exercises) Kindly send your requests to [sales@wspc.com](mailto:sales@wspc.com). This textbook gives an introduction to Partial Differential Equations (PDEs), for any reader wishing to learn and understand the basic concepts, theory, and solution techniques of elementary PDEs. The only prerequisite is an undergraduate course in Ordinary Differential Equations. This work contains a comprehensive treatment of the standard second-order linear PDEs, the heat equation, wave equation, and Laplace's equation. First-order and some common nonlinear PDEs arising in the physical and life sciences, with their solutions, are also covered. This textbook includes an introduction to Fourier series and their properties, an introduction to regular Sturm–Liouville



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boundary value problems, special functions of mathematical physics, a treatment of nonhomogeneous equations and boundary conditions using methods such as Duhamel's principle, and an introduction to the finite difference technique for the numerical approximation of solutions. All results have been rigorously justified or precise references to justifications in more advanced sources have been cited. Appendices providing a background in complex analysis and linear algebra are also included for readers with limited prior exposure to those subjects. The textbook includes material from which instructors could create a one- or two-semester course in PDEs. Students may also study this material in preparation for a graduate school (masters or doctoral) course in PDEs. The lecture slides, instructors' manual and students' manual is available upon request for all instructors who adopt this book as a course text. Please send your request to [sales@wspc.com](mailto:sales@wspc.com).

### **The Numerical Solution of Ordinary and Partial Differential Equations**

### **Numerical Solution of Partial Differential Equations**

Substantially revised, this authoritative study covers the standard finite difference methods of parabolic, hyperbolic, and elliptic equations, and includes the concomitant theoretical work on consistency, stability, and convergence. The new edition includes revised and greatly expanded sections on stability based on

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the Lax-Richtmeyer definition, the application of Padé approximants to systems of ordinary differential equations for parabolic and hyperbolic equations, and a considerably improved presentation of iterative methods. A fast-paced introduction to numerical methods, this will be a useful volume for students of mathematics and engineering, and for postgraduates and professionals who need a clear, concise grounding in this discipline.

### **Partial Differential Equations: Graduate Level Problems and Solutions**

Stable solutions are ubiquitous in differential equations. They represent meaningful solutions from a physical point of view and appear in many applications, including mathematical physics (combustion, phase transition theory) and geometry (minimal surfaces). *Stable Solutions of Elliptic Partial Differential Equations* offers a self-contained presentation of the notion of stability in elliptic partial differential equations (PDEs). The central questions of regularity and classification of stable solutions are treated at length. Specialists will find a summary of the most recent developments of the theory, such as nonlocal and higher-order equations. For beginners, the book walks you through the fine versions of the maximum principle, the standard regularity theory for linear elliptic equations, and the fundamental functional inequalities commonly used in this field. The text also includes two additional topics: the inverse-square potential and some background material on submanifolds of Euclidean space.

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