Solving Nonlinear Partial Differential Equations With Maple And Mathematica

Analytical Techniques for Solving Nonlinear Partial Differential Equations
Nonlinear Partial Differential Equations in Engineering
Nonlinear Partial Differential Equations
Physical Mathematics and Nonlinear Partial Differential Equations
Mathematics in Science and Engineering: A Series of Monographs and Textbooks
An Introduction to Nonlinear Partial Differential Equations
Nonlinear Partial Differential Equations
An Algebraic View of Generalized Solutions
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An Introduction
Numerical Continuation and Bifurcation in Nonlinear PDEs
Fourier Analysis and Nonlinear Partial Differential Equations
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Solutions
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Exact Solutions and Invariant Subspaces of Nonlinear Partial Differential Equations in Mechanics and Physics
Solving Nonlinear Partial Differential Equations on a CRAY X-MP
Symmetry and Ad-hoc Methods for Solving Nonlinear Partial Differential Equations
Systems of Nonlinear Partial Differential Equations
Nonlinear Partial Differential Equations
Three Numerical Schemes for Solving Nonlinear Partial Differential Equations
Partial Differential Equations
Nonlinear Systems of Partial Differential Equations
Nonlinear Partial Differential Equations
Separation of Variables and Exact Solutions to Nonlinear PDEs
Nonlinear Partial Differential Equations in Engineering and Applied Science
Non-Linear Partial Differential Equations
Maximum principles and applications
On Differential Geometric Techniques for Solving Nonlinear Partial Differential Equations
Handbook of Nonlinear Partial Differential Equations, Second Edition

Order Structure and Topological Methods in Nonlinear Partial Differential Equations
A Unified Approach for Solving Nonlinear Partial Differential Equations in Chemical Engineering Applications
PETSc for Partial Differential Equations: Numerical Solutions in C and Python
Transformation Methods for Nonlinear Partial Differential Equations
Nonlinear Partial Differential Equations and Their Applications
Numerical Methods for Nonlinear Partial Differential Equations
Solving Nonlinear Partial Differential Equations with Maple and Mathematica
An Introduction

HUFFMAN SIMONE

Analytical Techniques for Solving Nonlinear Partial Differential Equations Springer Science & Business Media
The maximum principle induces an order structure for partial differential equations, and has become an important tool in nonlinear analysis. This book is the first of two volumes to systematically introduce the applications of order structure in certain nonlinear partial differential equation problems.The maximum principle is

revisited through the use of the Krein-Rutman theorem and the principal eigenvalues. Its various versions, such as the moving plane and sliding plane methods, are applied to a variety of important problems of current interest. The upper and lower solution method, especially its weak version, is presented in its most up-to-date form with enough generality to cater for wide applications. Recent progress on the boundary blow-up problems and their applications are discussed, as well as some new symmetry and Liouville type results over half and entire spaces. Some of the results included here are published for the first time.
Nonlinear Partial Differential Equations in Engineering Springer During the last few years, several fairly systematic nonlinear theories of generalized solutions of rather arbitrary nonlinear partial differential equations have emerged. The aim of this volume is to offer the reader a sufficiently detailed introduction to two of these recent nonlinear theories which have so far contributed most to the study of generalized solutions of nonlinear partial differential equations, bringing the reader to the level of ongoing research. The essence of the two nonlinear theories presented in this volume is the observation that much of the mathematics concerning existence, uniqueness regularity,

etc., of generalized solutions for nonlinear partial differential equations can be reduced to elementary calculus in Euclidean spaces, combined with elementary algebra in quotient rings of families of smooth functions on Euclidean spaces, all of that joined by certain asymptotic interpretations. In this way, one avoids the complexities and difficulties of the customary functional analytic methods which would involve sophisticated topologies on various function spaces. The result is a rather elementary yet powerful and far-reaching method which can, among others, give generalized solutions to linear and nonlinear partial differential equations previously unsolved or even unsolvable within distributions or hyperfunctions. Part 1 of the volume discusses the basic limitations of the linear theory of distributions when dealing with linear or nonlinear partial differential equations, particularly the impossibility and degeneracy results. Part 2 examines the way Colombeau constructs a nonlinear theory of generalized functions and then succeeds in proving quite impressive existence, uniqueness, regularity, etc., results concerning generalized solutions of large classes of linear and nonlinear partial differential equations. Finally, Part 3 is a short presentation of the nonlinear theory of

Rosinger, showing its connections with Colombeau's theory, which it contains as a particular case.

Nonlinear Partial Differential Equations North Holland

Separation of Variables and Exact Solutions to Nonlinear PDEs is devoted to describing and applying methods of generalized and functional separation of variables used to find exact solutions of nonlinear partial differential equations (PDEs). It also presents the direct method of symmetry reductions and its more general version. In addition, the authors describe the differential constraint method, which generalizes many other exact methods. The presentation involves numerous examples of utilizing the methods to find exact solutions to specific nonlinear equations of mathematical physics. The equations of heat and mass transfer, wave theory, hydrodynamics, nonlinear optics, combustion theory, chemical technology, biology, and other disciplines are studied. Particular attention is paid to nonlinear equations of a reasonably general form that depend on one or several arbitrary functions. Such equations are the most difficult to analyze. Their exact solutions are of significant practical interest, as they are suitable to assess the accuracy of various approximate analytical and numerical methods.

The book contains new material previously unpublished in monographs. It is intended for a broad audience of scientists, engineers, instructors, and students specializing in applied and computational mathematics, theoretical physics, mechanics, control theory, chemical engineering science, and other disciplines. Individual sections of the book and examples are suitable for lecture courses on partial differential equations, equations of mathematical physics, and methods of mathematical physics, for delivering special courses and for practical training.

Physical Mathematics and Nonlinear Partial Differential Equations Elsevier

The aim of this book is to put together all the results that are known about the existence of formal, holomorphic and singular solutions of singular non linear partial differential equations.

Mathematics in Science and Engineering: A Series of Monographs and Textbooks Academic Press

"Partial Differential Equations and Solitary Waves Theory" is a self-contained book divided into two parts: Part I is a coherent survey bringing together newly developed methods for solving PDEs. While some traditional techniques are presented, this part does not require thorough understanding of abstract theories or compact concepts. Well-selected worked examples and exercises shall guide the reader through the text. Part II provides an extensive exposition of the solitary waves theory. This part handles nonlinear evolution equations by methods such as Hirota’s bilinear method or the tanh-coth method. A self-contained treatment is presented to discuss complete integrability of a wide class of nonlinear equations. This part presents in an accessible manner a systematic presentation of solitons, multi-soliton solutions, kinks, peakons, cuspons, and compactons. While the whole book can be used as a text for advanced undergraduate and graduate students in applied mathematics, physics and engineering, Part II will be most useful for graduate students and researchers in mathematics, engineering, and other related fields. Dr. Abdul-Majid Wazwaz is a Professor of Mathematics at Saint Xavier University, Chicago, Illinois, USA.

An Introduction to Nonlinear Partial Differential Equations John Wiley & Sons

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.

Nonlinear Partial Differential Equations John Wiley & Sons

This work will serve as an excellent first course in modern analysis. The main focus is on showing how self-similar solutions are useful in studying the behavior of solutions of nonlinear partial differential equations, especially those of parabolic type. This textbook will be an excellent resource for self-study or classroom use.

Springer Science & Business Media

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An Algebraic View of Generalized Solutions World Scientific

In the history of mathematics there are many situations in which cal- lations were performed incorrectly for important practical applications. Let us look at some examples, the history of computing the number ? began in Egypt and Babylon about 2000 years BC, since then many mathematicians have calculated ? (e. g. , Archimedes, Ptolemy, Vi` ete, etc.). The ?rst formula for computing decimal digits of ? was disc- ered by J. Machin (in 1706), who was the ?rst to correctly compute 100 digits of ?. Then many people used his method, e. g. , W. Shanks calculated ? with 707 digits (within 15 years), although due to mistakes only the ?rst 527 were correct. For the next examples, we can mention the history of computing the ?ne-structure constant ? (that was ?rst discovered by A. Sommerfeld), and the mathematical tables, exact - lutions, and formulas, published in many mathematical textbooks, were not veri?ed rigorously [25]. These errors could have a large e?ect on results obtained by engineers. But sometimes, the solution of such problems required such techn- ogy that was not available at that time. In modern mathematics there exist computers that can perform various mathematical operations for which humans are incapable. Therefore the computers can be used to verify the results obtained by humans, to discovery new results, to -provetheresultsthatahu

mancanobtainwithouta nytechnology. With respectto our example of computing?, we can mention that recently (in 2002) Y. Kanada, Y. Ushiro, H. Kuroda, and M.
An Algebraic View of Generalized Solutions Elsevier
An Introduction to Nonlinear Partial Differential Equations is a textbook on nonlinear partial differential equations. It is technique oriented with an emphasis on applications and is designed to build a foundation for studying advanced treatises in the field. The Second Edition features an updated bibliography as well as an increase in the number of exercises. All software references have been updated with the latest version of MATLAB@, the corresponding graphics have also been updated using MATLAB@. An increased focus on hydrogeology...
An Introduction CRC Press
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.

Numerical Continuation and Bifurcation in Nonlinear PDEs SIAM Shows novel and modern ways of solving differential equations using methods from contact and symplectic geometry.

Fourier Analysis and Nonlinear Partial Differential Equations American Mathematical Soc. In recent years, the Fourier analysis methods have expereinced a growing interest in the study of partial differential equations. In particular, those techniques based on the Littlewood-Paley decomposition have proved to be very efficient for the study of evolution equations. The present book aims at presenting self-contained, state- of- the- art models of those techniques with applications to different classes of partial differential equations: transport, heat, wave and Schrödinger equations. It also offers more sophisticated models originating from fluid mechanics (in particular the incompressible and compressible Navier-Stokes equations) or general relativity. It is either directed to anyone with a good undergraduate level of knowledge in analysis or useful for experts who are eager to know the benefit that one might gain from Fourier analysis when dealing with nonlinear partial differential equations.

Asymptotic Behavior of Solutions and Self-Similar Solutions

Academic Press

The purpose of the book is to provide research workers in applied mathematics, physics, and engineering with practical geometric methods for solving systems of nonlinear partial differential equations. The first two chapters provide an introduction to the more or less classical results of Lie dealing with symmetries and similarity solutions. The results, however, are presented in the context of contact manifolds rather than the usual jet bundle formulation and provide a number of new conclusions. The remaining three chapters present essentially new methods of solution that are based on recent publications of the authors'. The text contains numerous fully worked examples so that the reader can fully appreciate the power and scope of the new methods. In effect, the problem of solving systems of nonlinear partial differential equations is reduced to the problem of solving families of autonomous ordinary differential equations. This allows the graphs of solutions of the system of partial differential equations to be realized as certain leaves of a foliation of an appropriately defined contact manifold. In fact, it is often possible to obtain families of solutions whose graphs foliate an open subset of the contact manifold. These ideas are extended in the final chapter by developing the theory of transformations that map a foliation of a contact manifold onto a foliation. This analysis gives rise to results of surprising depth and practical significance. In particular, an extended Hamilton-Jacobi method for solving systems of partial differential equations is obtained.

Handbook of Nonlinear Partial Differential Equations Cambridge University Press Nonlinear Partial Differential Equations: A Symposium on Methods of Solution is a collection of papers presented at the seminar on methods of solution for nonlinear partial differential equations, held at the University of Delaware, Newark, Delaware on December 27-29, 1965. The sessions are divided into four Symposia: Analytic Methods, Approximate Methods, Numerical Methods, and Applications. Separating 19 lectures into chapters, this book starts with a presentation of the methods of similarity analysis, particularly considering the merits, advantages and disadvantages of the methods. The subsequent chapters describe the fundamental ideas behind the methods for the solution of partial differential equation derived from the theory of dynamic programming and from finite systems of ordinary differential equations. These topics are followed by reviews of the principles to the lubrication approximation and compressible boundary-layer flow computation. The discussion then shifts to several applications of nonlinear partial differential equations, including in electrical problems, two-phase flow, hydrodynamics, and heat transfer. The remaining chapters cover other solution methods for partial differential equations, such as the synergetic approach. This book will prove useful to applied mathematicians, physicists, and engineers.

Singular Nonlinear Partial Differential Equations CRC Press

This book is devoted to the applications of probability theory to the theory of nonlinear partial differential equations. More precisely, it is shown that all positive solutions for a class of nonlinear elliptic equations in a domain are described in terms of their traces on the boundary of the domain. The main probabilistic tool is the theory of superdiffusions, which describes a random evolution of a cloud of particles. A substantial enhancement of this theory is presented that will be of interest to anyone who works on applications of probabilistic methods to mathematical analysis. The book is suitable for graduate students and research mathematicians interested in probability theory and its applications to differential equations. Also of interest by this author is ""Diffusions, Superdiffusions and Partial Differential Equations"" in the ""AMS"" series, Colloquium Publications.

Asymptotic Behavior of Solutions and Self-Similar Solutions

Solving Nonlinear Partial Differential Equations with Maple and Mathematica

This book contains the written versions of lectures delivered since 1997 in the well-known weekly seminar on Applied Mathematics at the Collège de France in Paris, directed by Jacques-Louis Lions. It is the 14th and last of the series, due to the recent and untimely death of Professor Lions. The texts in this volume deal mostly with various aspects of the theory of nonlinear partial differential equations. They present both theoretical and applied results in many fields of growing importance such as Calculus of variations and optimal control, optimization, system theory and control, operations research, fluids and continuum mechanics, nonlinear dynamics, meteorology and climate, homogenization and material science, numerical analysis and scientific computations The book is of interest to everyone from postgraduate, who wishes to follow the most recent progress in these fields.

Exact Solutions and Invariant Subspaces of Nonlinear Partial Differential Equations in Mechanics and Physics CRC Press This is an introduction to methods for solving nonlinear partial differential equations (NLPDEs). After the introduction of several PDEs drawn from science and engineering, the reader is introduced to techniques used to obtain exact solutions of NPDEs. The chapters include the following topics: Compatibility, Differential Substitutions, Point and Contact Transformations, First Integrals, and Functional Separability. The reader is guided through these chapters and is provided with several detailed examples. Each chapter ends with a

series of exercises illustrating the material presented in each chapter. The book can be used as a textbook for a second course in PDEs (typically found in both science and engineering programs) and has been used at the University of Central Arkansas for more than ten years.
Solving Nonlinear Partial Differential Equations on a CRAY X-MP Springer Science & Business Media
A massive transition of interest from solving linear partial differential equations to solving nonlinear ones has taken place during the last two or three decades. The availability of better computers has often made numerical experimentations progress faster than the theoretical understanding of nonlinear partial differential equations. The three most important nonlinear phenomena observed so far both experimentally and numerically, and studied theoretically in connection with such equations have been the solitons, shock waves and turbulence or chaotical processes. In many ways, these phenomena have presented increasing difficulties in the mentioned order. In particular, the latter two phenomena necessarily lead to nonclassical or generalized solutions for nonlinear partial differential equations.
Symmetry and Ad-hoc Methods for Solving Nonlinear Partial Differential Equations Elsevier

This book provides a hands-on approach to numerical continuation and bifurcation for nonlinear PDEs in 1D, 2D, and 3D. Partial differential equations (PDEs) are the main tool to describe spatially and temporally extended systems in nature. PDEs usually come with parameters, and the study of the parameter dependence of their solutions is an important task. Letting one parameter vary typically yields a branch of solutions, and at special parameter values, new branches may bifurcate. After a concise review of some analytical background and numerical methods, the author explains the free MATLAB package pde2path by using a large variety of examples with demo codes that can be easily adapted to the reader's given problem. Numerical Continuation and Bifurcation in Nonlinear PDEs will appeal to applied mathematicians and scientists from physics, chemistry, biology, and economics interested in the numerical solution of nonlinear PDEs, particularly the parameter dependence of solutions. It can be used as a supplemental text in courses on nonlinear PDEs and modeling and bifurcation.

Glenn Beck
• The Inmate: A Gripping Psychological Thriller By Freida Mcfadden
• The Five-star Weekend By Elin Hilderbrand
• Our Class Is A Family (our Class Is A Family & Our School Is A Family) By Shannon Olsen
• Blowback: A Warning To Save Democracy From The Next Trump By Miles Taylor
• The Mountain Is You: Transforming Self-sabotage Into Self-mastery
• Never Never: A Romantic Suspense Novel Of Love And Fate By Colleen Hoover
• What To Expect When You're Expecting
• The Going To Bed Book
• I Will Teach You To Be Rich: No Guilt. No Excuses. Just A 6-week Program That Works (second Edition)