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"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.

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*)We closely follow the

approach of A.-M. Wazwaz [4] in chapters 13+14 of his book "Partial Differential Equations and Solitary Waves Theory". u (t, x) is a function of the spatio-temporal ...

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Partial Differential Equations and Solitary Waves Theory ...

Partial differential equations are ubiquitous in mathematically-oriented scientific fields, such as physics and engineering. For instance, they are foundational in the modern scientific understanding of sound, heat, diffusion, electrostatics, electrodynamics, fluid dynamics, elasticity, general relativity, and quantum mechanics.

Partial differential equation - Wikipedia
Partial Differential Equations and Solitary Waves Theory: Wazwaz, Abdul-Majid: Amazon.com.au: Books

Partial Differential Equations and Solitary Waves Theory ...
But partial differential equations, or PDEs, are

also kind of magical. They're a category of math equations that are really good at describing change over space and time, and thus very handy for ...

"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.

"Partial Differential

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Features methods for solving Partial Differential Equations (PDEs). This book covers solitary waves theory. It also handles nonlinear evolution equations by methods such as Hirota's bilinear method or the tanh-coth method.

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.

This book contains two review articles on the dynamics of partial differential equations that deal with closely related topics but can be read independently. Wayne reviews recent results on the global dynamics of the two-dimensional Navier-Stokes equations. This system exhibits stable vortex solutions: the topic of Wayne's contribution is how solutions that start from arbitrary initial conditions evolve towards stable vortices. Weinstein considers the dynamics of localized states in nonlinear Schrodinger and Gross-Pitaevskii equations that describe many optical and quantum systems. In this contribution, Weinstein reviews recent bifurcations results of solitary waves, their linear and nonlinear stability properties and results about radiation damping where waves lose energy through radiation. The articles, written independently, are combined into one volume to showcase the tools of dynamical systems theory at work in explaining qualitative phenomena associated with two classes of partial differential equations with very different physical origins and mathematical properties.

Although the Partial Differential Equations

(PDE) models that are now studied are usually beyond traditional mathematical analysis, the numerical methods that are being developed and used require testing and validation. This is often done with PDEs that have known, exact, analytical solutions. The development of analytical solutions is also an active area of research, with many advances being reported recently, particularly traveling wave solutions for nonlinear evolutionary PDEs. Thus, the current development of analytical solutions directly supports the development of numerical methods by providing a spectrum of test problems that can be used to evaluate numerical methods. This book surveys some of these new developments in analytical and numerical methods, and relates the two through a series of PDE examples. The PDEs that have been selected are largely "named" since they carry the names of their original contributors. These names usually signify that the PDEs are widely recognized and used in many application areas. The authors' intention is to provide a set of numerical and analytical methods based on the concept of a traveling wave, with a central feature of conversion of the PDEs to ODEs. The Matlab and Maple software will be available for download from this website shortly. www.pdecomp.net Includes a spectrum of applications in science, engineering, applied mathematics Presents a combination of numerical and analytical methods Provides transportable computer codes in Matlab and Maple

Mathematics of Complexity and Dynamical Systems is an authoritative reference to the basic tools and concepts of complexity, systems theory, and dynamical systems from the perspective of pure and applied mathematics. Complex systems are systems that comprise many interacting parts with the ability to generate a new quality of collective behavior through self-organization, e.g. the spontaneous formation of temporal, spatial or functional structures. These systems are often characterized by extreme sensitivity to initial conditions as well as emergent behavior that are not readily predictable or even completely deterministic. The more than 100 entries in this wide-ranging, single source work provide a comprehensive explication of the theory and applications of mathematical complexity, covering ergodic theory, fractals and multifractals, dynamical systems, perturbation theory, solitons, systems and control theory, and related topics. Mathematics of Complexity and Dynamical Systems is an essential reference for all those interested in mathematical complexity, from undergraduate and graduate students up through professional researchers.

The revised and enlarged third edition of this successful book presents a comprehensive and systematic treatment of linear and nonlinear partial differential equations and their varied and updated applications. In an effort to make the book more useful for a diverse readership, updated modern examples of applications are chosen from areas of fluid dynamics, gas dynamics, plasma physics, nonlinear dynamics, quantum mechanics, nonlinear optics, acoustics, and wave propagation. Nonlinear Partial

Differential Equations for Scientists and Engineers, Third Edition, improves on an already highly complete and accessible resource for graduate students and professionals in mathematics, physics, science, and engineering. It may be used to great effect as a course textbook, research reference, or self-study guide.

Mathematics for Nonlinear Physics: Solitary Wave in the Center of the Resolution of Dispersive Nonlinear Partial Differential Equations By: J.R. Bogning Mathematics for Nonlinear Physics: Solitary Wave in the Center of the Resolution of Dispersive Nonlinear

Partial Differential Equations is the result of ten years of high-level research on the dynamics of solitary waves. In the context of his different work in nonlinear physics, J.R. Bogning encountered differential equations with nonlinear partial derivatives whose search for solutions was not always obvious. But beyond the fact that these equations encountered were not always easy to integrate, the observation he made was that very few works proposed forced solitary wave solutions. So this book develops in detail new mathematical techniques to solve some types of nonlinear equations encountered in nonlinear physics.

This book is unique in terms of its content; the theories developed inside are not in any other book. This book is the pioneer in the theory developed within it and will be the reference book from which other researchers and scientists will rely to extend and develop the mathematical concepts found there. Mastery of the properties and functions developed in the book will help to digitize solitary waves.

By means of easy examples, such as the Korteweg-de Vries, the Harry Dym, the sine-Gordon equations, and the Hirota coupled system, it is shown how nonlinear partial differential equations can be exactly solved by a direct algebraic method. The physical concept, on which the method relies, is one of generation and mixing of the real exponential solutions of the underlying linear equations. This approach leads in a straightforward way to single solitary waves of pulse, kink and cusp shape. The extension of the method towards the construction of multi-soliton solutions and the connections with other direct methods are outlined.