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# Distributions and Nonlinear Partial Differential Equations

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# Distributions And Nonlinear Partial Differential Equations

**Alexander I. Saichev, Wojbor A.  
Woyczynski**



## Distributions And Nonlinear Partial Differential Equations:

**Distributions and Nonlinear Partial Differential Equations** E. E. Rosinger, 2014-09-01     *Distributions and Nonlinear Partial Differential Equations* Elemer E. Rosinger, 2006-11-15     *Generalized Solutions of Nonlinear Partial Differential Equations* E.E. Rosinger, 1987-11-01 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* ,1980-01-01 *Nonlinear Partial Differential Equations*     *Distributions in the Physical and Engineering Sciences, Volume 2* Alexander I. Saichev, Wojbor A. Woźczyński, 2013-09-05 *Distributions in the Physical and Engineering Sciences* is a comprehensive exposition on analytic methods for solving science and engineering problems It is written from the unifying viewpoint of distribution theory and enriched with many modern topics which are important for practitioners and researchers The goal of the books is to give the reader specialist and non specialist useable and modern mathematical tools in their research and analysis Volume 2 *Linear and Nonlinear Dynamics of Continuous Media* continues the multivolume project which endeavors to show how the theory of distributions also called the theory of generalized functions can be used by graduate students and researchers in applied mathematics physical sciences and engineering It contains an analysis of the three basic types of linear partial differential equations elliptic parabolic and hyperbolic as well as chapters on first order nonlinear partial differential equations and conservation laws and generalized solutions of first order nonlinear PDEs

Nonlinear wave growing interface and Burger s equations KdV equations and the equations of gas dynamics and porous media are also covered The careful explanations accessible writing style many illustrations examples and solutions also make it suitable for use as a self study reference by anyone seeking greater understanding and proficiency in the problem solving methods presented The book is ideal for a general scientific and engineering audience yet it is mathematically precise Features Application oriented exposition of distributional Dirac delta methods in the theory of partial differential equations Abstract formalism is kept to a minimum Careful and rich selection of examples and problems arising in real life situations Complete solutions to all exercises appear at the end of the book Clear explanations motivations and illustration of all necessary mathematical concepts      *Non-Linear Partial Differential Equations* E.E. Rosinger,1990-11-22 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      **Applied Partial Differential Equations** J. David Logan,2004-05-11 This text is written for the standard one semester undergraduate course in elementary partial differential equations The topics include derivations of some of the standard equations of mathematical physics including the heat equation the wave equation and Laplace s equation and methods for solving those equations on bounded and unbounded domains Methods include eigenfunction expansions or separation of variables and methods based on Fourier and Laplace transforms      **From Particle Systems to Partial Differential Equations** Patrícia Gonçalves,Ana Jacinta Soares,2017-11-15 This book addresses mathematical problems motivated by various applications in physics engineering chemistry and biology It gathers the lecture notes from the mini course presented by Jean Christophe Mourrat on the construction of the various stochastic basic terms involved in the formulation of the dynamic 4 theory in three space dimensions as well as selected contributions presented at the fourth meeting on Particle Systems and PDEs which was held at the University of Minho s Centre of Mathematics in December 2015 The purpose of the conference was to bring together prominent researchers working in the fields of particle systems and partial differential equations offering them a forum to present their recent results and discuss their topics of expertise The meeting was also intended to present to a vast and varied public including young researchers the area of interacting particle systems its underlying motivation and its relation to partial differential equations The book will be of great interest to probabilists analysts and all mathematicians whose work focuses on topics in mathematical physics stochastic processes and differential equations in general as well as physicists working in statistical mechanics and kinetic

theory     **Distributions and Convolution Equations** Semen Grigor'evich Gindikin, Leonid Romanovich Volevich, 1992 The authors apply the results of many years of their own original research to a systematic presentation of the theory of distributions in this monograph which can also be used as a very expensive textbook on the theory of distribution for graduate students The first part is devoted to the Cauchy problem while the second part deals with the Wiener Hopf equation and related topics in the theory of boundary value problems for convolution equations To make their work more accessible to readers new to this field the authors restrict initial treatment of problems to the half line and formulate only principal results in their simplest form Special results and possible generalizations are presented as problems and exercises Annotation copyrighted by Book News Inc Portland OR     *Multiplication of Distributions and Applications to Partial Differential Equations* Michael Oberguggenberger, 1992     *Partial Differential Equations in General Relativity* Alan D. Rendall, 2008-04-03 A text that will bring together PDE theory general relativity and astrophysics to deliver an overview of theory of partial differential equations for general relativity The text will include numerous examples and provide a unique resource for graduate students in mathematics and physics numerical relativity and cosmology     *Distribution Solutions of Nonlinear Partial Differential Equations and Stability Properties* E. E. Rosinger, 1978     **Distributions and Pseudo-differential Operators** Samuel Zaidman, 1991     **Distributions and Analytic Functions** Richard D. Carmichael, Dragiša Mitrović, 1989     **Distributions, Ultradistributions and Other Generalized Functions** R. F. Hoskins, J. Sousa Pinto, 1994 This text compares and evaluates various approaches to the theory of distributions which have appeared since the original presentation by Laurent Schwartz in the 1950s In so doing it attempts to clarify some of the differences in notation and terminology which have arisen It includes a systematic treatment of the ultradistributions which arise in connections with the extended definition of the Fourier transform     *Numerical Methods* Donald Greenspan, P. Rózsa, 1991     **Elementary Introduction to New Generalized Functions** J.F. Colombeau, 2011-08-18 The author's previous book *New Generalized Functions and Multiplication of Distributions* North Holland 1984 introduced new generalized functions in order to explain heuristic computations of Physics and to give a meaning to any finite product of distributions The aim here is to present these functions in a more direct and elementary way In Part I the reader is assumed to be familiar only with the concepts of open and compact subsets of  $\mathbb{R}$  or  $\mathbb{C}$  functions of several real variables and with some rudiments of integration theory Part II defines tempered generalized functions i.e. generalized functions which are in some sense increasing at infinity no faster than a polynomial as well as all their partial derivatives Part III shows that in this setting the partial differential equations have new solutions The results obtained show that this setting is perfectly adapted to the study of nonlinear partial differential equations and indicate some new perspectives in this field     *Bulletin of the Institute of Mathematics, Academia Sinica* Zhong yang yan jiu yuan. Shu xue yan jiu suo, 2006     **Bulletin (new Series) of the American Mathematical Society**, 1996     **Bulletin of the American Mathematical Society**, 1996

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