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# LIE GROUP ANALYSIS OF DIFFERENTIAL EQUATIONS

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# Group Analysis Of Differential Equations

**Nail H. Ibragimov**



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examples and problems accompanied by detailed solutions and figures In comparison with the known beginner guides to Lie group analysis the book is oriented toward students who are interested in financial mathematics mathematical finance and economics We provide the results of the Lie group analysis of actual models in Financial Mathematics using recent publications These models are usually formulated as nonlinear partial differential equations and are rather difficult to make use of With the help of Lie group analysis it is possible to describe some important properties of these models and to obtain interesting reductions in a clear and understandable algorithmic way The book can serve as a short introduction for a further study of modern geometrical analysis applied to models in financial mathematics It can also be used as textbook in a master s program in an intensive compact course or for self study The textbook with a large number of examples will be useful not only for students who are interested in Financial Mathematics but also for people who are working in other areas of research that are not directly connected with Physics for instance in such areas of Applied Mathematics like mathematical economy bio systems coding theory etc

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approximate symmetry groups for equations with a small parameter group analysis of differential equations with distributions integro differential equations recursions and symbolic software packages The text provides an ideal introduction to the modern group analysis and addresses issues to both beginners and experienced researchers in the application of Lie group methods      *Applications of Group-Theoretical Methods in Hydrodynamics* V.K. Andreev,O.V. Kaptsov,Vladislav V. Pukhnachev,A.A. Rodionov,2013-03-14 It was long ago that group analysis of differential equations became a powerful tool for studying nonlinear equations and boundary value problems This analysis was especially fruitful in application to the basic equations of mechanics and physics because the invariance principles are already involved in their derivation It is in no way a coincidence that the equations of hydrodynamics served as the first object for applying the new ideas and methods of group analysis which were developed by I V Ovsyannikov and his school The authors rank themselves as disciples of the school The present monograph deals mainly with group theoretic classification of the equations of hydrodynamics in the presence of planar and rotational symmetry and also with construction of exact solutions and their physical interpretation It is worth noting that the concept of exact solution to a differential equation is not defined rigorously different authors understand it in different ways The concept of exact solution expands along with the progress of mathematics solutions in elementary functions in quadratures and in special functions solutions in the form of convergent series with effectively computable terms solutions whose searching reduces to integrating ordinary differential equations etc We consider it justifiable to enrich the set of exact solutions with rank one and rank two invariant and partially invariant solutions to the equations of hydrodynamics      **Nonlinear Reaction-Diffusion-Convection Equations** Roman Cherniha,Mykola Serov,Oleksii Pliukhin,2017-11-02 It is well known that symmetry based methods are very powerful tools for investigating nonlinear partial differential equations PDEs notably for their reduction to those of lower dimensionality e g to ODEs and constructing exact solutions This book is devoted to 1 search Lie and conditional non classical symmetries of nonlinear RDC equations 2 constructing exact solutions using the symmetries obtained and 3 their applications for solving some biologically and physically motivated problems The book summarises the results derived by the authors during the last 10 years and those obtained by some other authors      Groups, Invariants, Integrals, and Mathematical Physics Maria Ulan,Stanislav Hronek,2023-05-31 This volume presents lectures given at the Wis a 20 21 Winter School and Workshop Groups Invariants Integrals and Mathematical Physics organized by the Baltic Institute of Mathematics The lectures were dedicated to differential invariants with a focus on Lie groups pseudogroups and their orbit spaces and Poisson structures in algebra and geometry and are included here as lecture notes comprising the first two chapters Following this chapters combine theoretical and applied perspectives to explore topics at the intersection of differential geometry differential equations and category theory Specific topics covered include The multisymplectic and variational nature of Monge Amp re equations in dimension four Integrability of fifth order equations admitting a Lie symmetry algebra Applications of the van

Kampen theorem for groupoids to computation of homotopy types of striped surfaces A geometric framework to compare classical systems of PDEs in the category of smooth manifolds Groups Invariants Integrals and Mathematical Physics is ideal for graduate students and researchers working in these areas A basic understanding of differential geometry and category theory is assumed

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*Waves and Stability in Continuous Media - Proceedings of the 15th Conference on Wascom 2009* Antonio Maria Greco, Salvatore Rionero, Tommaso Ruggeri, 2010 This book contains recent contributions in the field of waves propagation and stability in continuous media The volume is the sixth in a series published by World Scientific since 1999

**Equivalence, Invariants and Symmetry** Peter J. Olver, 1995-06-30 Drawing on a wide range of mathematical disciplines including geometry analysis applied mathematics and algebra this book presents an innovative synthesis of methods used to study problems of equivalence and symmetry which arise in a variety of mathematical fields and physical applications Systematic and constructive methods for solving equivalence problems and calculating symmetries are developed and applied to a wide variety of mathematical systems including differential equations variational problems manifolds Riemannian metrics polynomials and differential operators Particular emphasis is given to the construction and classification of invariants and to the reductions of complicated objects to simple canonical forms This book will be a valuable resource for students and researchers in geometry analysis algebra mathematical physics and other related fields

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