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Nonlinear Wave Equations, Formation of Singularities

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Nonlinear Wave Equations Formation Of Singularities

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Nonlinear Wave Equations Formation Of Singularities:

Nonlinear Wave Equations, Formation of Singularities Fritz John,2019 *Remarks on the formation of singularities for nonlinear wave equations in bounded domains* Reinhard Racke,1991 Remarks on the Formation of Singularities for Nonlinear Wave Equations in Bounded Domains R. Racke,1991 **Nonlinear Wave Equations** Satyanad Kichenassamy,2021-05-30 This work examines the mathematical aspects of nonlinear wave propagation emphasizing nonlinear hyperbolic problems It introduces the tools that are most effective for exploring the problems of local and global existence singularity formation and large time behaviour of solutions and for the study of perturbation methods

Nonlinear Wave Equations Tatsien Li,Yi Zhou,2017-11-23 This book focuses on nonlinear wave equations which are of considerable significance from both physical and theoretical perspectives It also presents complete results on the lower bound estimates of lifespan including the global existence which are established for classical solutions to the Cauchy problem of nonlinear wave equations with small initial data in all possible space dimensions and with all possible integer powers of nonlinear terms Further the book proposes the global iteration method which offers a unified and straightforward approach for treating these kinds of problems Purely based on the properties of solut ions to the corresponding linear problems the method simply applies the contraction mapping principle **Lectures on Nonlinear Evolution Equations** Reinhard Racke,2015-08-31 This book mainly serves as an elementary self contained introduction to several important aspects of the theory of global solutions to initial value problems for nonlinear evolution equations The book employs the classical method of continuation of local solutions with the help of a priori estimates obtained for small data The existence and uniqueness of small smooth solutions that are defined for all values of the time parameter are investigated Moreover the asymptotic behaviour of the solutions is described as time tends to infinity The methods for nonlinear wave equations are discussed in detail Other examples include the equations of elasticity heat equations the equations of thermoelasticity Schr dinger equations Klein Gordon equations Maxwell equations and plate equations To emphasize the importance of studying the conditions under which small data problems offer global solutions some blow up results are briefly described Moreover the prospects for corresponding initial boundary value problems and for open questions are provided In this second edition initial boundary value problems in waveguides are additionally considered *Handbook of Differential Equations: Evolutionary Equations* C.M. Dafermos,Eduard Feireisl,2005-10-05 The aim of this Handbook is to acquaint the reader with the current status of the theory of evolutionary partial differential equations and with some of its applications Evolutionary partial differential equations made their first appearance in the 18th century in the endeavor to understand the motion of fluids and other continuous media The active research effort over the span of two centuries combined with the wide variety of physical phenomena that had to be explained has resulted in an enormous body of literature Any attempt to produce a comprehensive survey would be futile The aim here is to collect review articles written by leading experts which will highlight the present

and expected future directions of development of the field The emphasis will be on nonlinear equations which pose the most challenging problems today Volume I of this Handbook does focus on the abstract theory of evolutionary equations Volume 2 considers more concrete problems relating to specific applications Together they provide a panorama of this amazingly complex and rapidly developing branch of mathematics Nonlinear Waves Peter R. Popivanov,Angela Slavova,2011 Big Nate is the star goalie of his school s soccer team and he is tasked with defending his goal and saving the day against Jefferson Middle School their archrival Nonlinear Hyperbolic Equations, Spectral Theory, and Wavelet Transformations Sergio Albeverio,Michael Demuth,Elmar Schrohe,Bert-Wolfgang Schulze,2012-12-06 This volume focuses on recent developments in non linear and hyperbolic equations It will be a most valuable resource for researchers in applied mathematics the theory of wavelets and in mathematical and theoretical physics Nine up to date contributions have been written on invitation by experts in the respective fields The book is the third volume of the subseries Advances in Partial Differential Equations **Nonlinear Wave Equations** Yan Guo,2000 This volume presents original research papers and expository articles from the conference in honour of Walter A Strauss s 60th birthday held at Brown University in Providence Rhode Island The book offers a collection of original papers and expository articles mainly devoted to the study of nonlinear wave equations The articles cover a wide range of topics including scattering theory dispersive waves classical field theory mathematical fluid dynamics kinetic theory stability theory and variational methods The book offers a cross section of current trends and research directions in the study of nonlinear wave equations and related topics **Partial Differential Equations and Mathematical Physics** Lars Hörmander,Anders Melin,2013-04-17 On March 17 19 and May 19 21 1995 analysis seminars were organized jointly at the universities of Copenhagen and Lund under the heading Danish Swedish Analysis Seminar The main topic was partial differen tial equations and related problems of mathematical physics The lectures given are presented in this volume some as short abstracts and some as quite complete expositions or survey papers They span over a large vari ety of topics The most frequently occurring theme is the use of microlocal analysis which is now important also in the study of non linear differential equations although it originated entirely within the linear theory Perhaps it is less surprising that microlocal analysis has proved to be useful in the study of mathematical problems of classical quantum mechanics for it re ceived a substantial input of ideas from that field The scientific committee for the invitation of speakers consisted of Gerd Grubb in Copenhagen Lars Hormander and Anders MeHn in Lund and Jo hannes Sjostrand in Paris Lars Hormander and Anders Melin have edited the proceedings They were hosts of the seminar days in Lund while Gerd Grubb was the host in Copenhagen Financial support was obtained from the mathematics departments in Copenhagen and Lund CNRS in France the Danish and Swedish Na tional Research Councils Gustaf Sigurd Magnuson s foundation at the Royal Swedish Academy of Sciences and the Wenner Gren foundation in Stockholm We want to thank all these organisations for their support **Linear and Quasi-linear Evolution Equations in Hilbert Spaces** Pascal Cherrier,Albert

Milani,2022-07-14 This book considers evolution equations of hyperbolic and parabolic type These equations are studied from a common point of view using elementary methods such as that of energy estimates which prove to be quite versatile The authors emphasize the Cauchy problem and present a unified theory for the treatment of these equations In particular they provide local and global existence results as well as strong well posedness and asymptotic behavior results for the Cauchy problem for quasi linear equations Solutions of linear equations are constructed explicitly using the Galerkin method the linear theory is then applied to quasi linear equations by means of a linearization and fixed point technique The authors also compare hyperbolic and parabolic problems both in terms of singular perturbations on compact time intervals and asymptotically in terms of the diffusion phenomenon with new results on decay estimates for strong solutions of homogeneous quasi linear equations of each type This textbook presents a valuable introduction to topics in the theory of evolution equations suitable for advanced graduate students The exposition is largely self contained The initial chapter reviews the essential material from functional analysis New ideas are introduced along with their context Proofs are detailed and carefully presented The book concludes with a chapter on applications of the theory to Maxwell s equations and von Karman s equations Blowup for Nonlinear Hyperbolic Equations Serge Alinhac,2013-12-01 Solutions to partial differential equations or systems often over specific time periods exhibit smooth behaviour Given sufficient time however they almost invariably undergo a brutal change in behaviour and this phenomenon has become known as blowup In this book the author provides an overview of what is known about this situation and discusses many of the open problems concerning it *Shock Formation in Small-Data Solutions to 3D Quasilinear Wave Equations* Jared Speck,2016-12-07 In 1848 James Challis showed that smooth solutions to the compressible Euler equations can become multivalued thus signifying the onset of a shock singularity Today it is known that for many hyperbolic systems such singularities often develop However most shock formation results have been proved only in one spatial dimension Serge Alinhac s groundbreaking work on wave equations in the late 1990s was the first to treat more than one spatial dimension In 2007 for the compressible Euler equations in vorticity free regions Demetrios Christodoulou remarkably sharpened Alinhac s results and gave a complete description of shock formation In this monograph Christodoulou s framework is extended to two classes of wave equations in three spatial dimensions It is shown that if the nonlinear terms fail to satisfy the null condition then for small data shocks are the only possible singularities that can develop Moreover the author exhibits an open set of small data whose solutions form a shock and he provides a sharp description of the blow up These results yield a sharp converse of the fundamental result of Christodoulou and Klainerman who showed that small data solutions are global when the null condition is satisfied Readers who master the material will have acquired tools on the cutting edge of PDEs fluid mechanics hyperbolic conservation laws wave equations and geometric analysis *New Trends in the Theory of Hyperbolic Equations* Michael Reissig,Bert-Wolfgang Schulze,2006-03-21 Presenting several developments in the theory of hyperbolic equations this book s contributions deal

with questions of low regularity critical growth ill posedness decay estimates for solutions of different non linear hyperbolic models and introduce new approaches based on microlocal methods Hyperbolic Systems of Balance Laws Alberto Bressan,Denis Serre,Mark Williams,Kevin Zumbrun,2007-05-26 This volume includes four lecture courses by Bressan Serre Zumbrun and Williams and a Tutorial by Bressan on the Center Manifold Theorem Bressan introduces the vanishing viscosity approach and clearly explains the building blocks of the theory Serre focuses on existence and stability for discrete shock profiles The lectures by Williams and Zumbrun deal with the stability of multidimensional fronts *Collected Papers* Fritz John,1985 Partial Differential Equations Robert C. McOwen,2004 *Harmonic Analysis And Wave Equations* Jean-michel Coron,Tatsien Li,Wei-min Wang,2019-08-19 This book is a collection of lecture notes for the LIASFMA School and Workshop on Harmonic Analysis and Wave Equations which was held on May 8 18 2017 at Fudan University in Shanghai China The aim of the LIASFMA School and Workshop is to bring together Chinese and French experts to discuss and dissect recent progress in these related fields and to disseminate state of art new knowledge and new concepts to graduate students and junior researchers The book provides the readers with a unique and valuable opportunity to learn from and communicate with leading experts in nonlinear wave type equations The readers will witness the major development with the introduction of modern harmonic analysis and related techniques **Fritz John Collected Papers** J. Moser,1985-01-01

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