

CONTEMPORARY MATHEMATICS

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Algebraic and Analytic Aspects of Integrable Systems and Painlevé Equations

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American Mathematical Society

Algebraic Integrable Equations Contemporary Mathematics

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Algebraic Integrable Equations Contemporary Mathematics:

Algebraic and Analytic Aspects of Integrable Systems and Painlevé Equations Anton Dzhamay, Kenichi Maruno, Christopher M. Ormerod, 2015-10-28 This volume contains the proceedings of the AMS Special Session on Algebraic and Analytic Aspects of Integrable Systems and Painlevé Equations held on January 18 2014 at the Joint Mathematics Meetings in Baltimore MD The theory of integrable systems has been at the forefront of some of the most important developments in mathematical physics in the last 50 years The techniques to study such systems have solid foundations in algebraic geometry differential geometry and group representation theory Many important special solutions of continuous and discrete integrable systems can be written in terms of special functions such as hypergeometric and basic hypergeometric functions The analytic tools developed to study integrable systems have numerous applications in random matrix theory statistical mechanics and quantum gravity One of the most exciting recent developments has been the emergence of good and interesting discrete and quantum analogues of classical integrable differential equations such as the Painlevé equations and soliton equations Many algebraic and analytic ideas developed in the continuous case generalize in a beautifully natural manner to discrete integrable systems The editors have sought to bring together a collection of expository and research articles that represent a good cross section of ideas and methods in these active areas of research within integrable systems and their applications

Algebraic Structures In Integrability: Foreword By Victor Kac Vladimir V Sokolov, 2020-06-05 Relationships of the theory of integrable systems with various branches of mathematics are extremely deep and diverse On the other hand the most fundamental exactly integrable systems often have applications in theoretical physics Therefore many mathematicians and physicists are interested in integrable models The book is intelligible to graduate and PhD students and can serve as an introduction to separate sections of the theory of classical integrable systems for scientists with algebraic inclinations For the young the book can serve as a starting point in the study of various aspects of integrability while professional algebraists will be able to use some examples of algebraic structures which appear in the theory of integrable systems for wide ranging generalizations The statements are formulated in the simplest possible form However some ways of generalization are indicated In the proofs only essential points are mentioned while for technical details references are provided The focus is on carefully selected examples In addition the book proposes many unsolved problems of various levels of complexity A deeper understanding of every chapter of the book may require the study of more rigorous and specialized literature

Algebraic and Geometric Aspects of Integrable Systems and Random Matrices Anton Dzhamay, Ken'ichi Maruno, Virgil U. Pierce, 2013-06-26 This volume contains the proceedings of the AMS Special Session on Algebraic and Geometric Aspects of Integrable Systems and Random Matrices held from January 6 7 2012 in Boston MA The very wide range of topics represented in this volume illustrates

Integrable Systems on Lie Algebras and Symmetric Spaces A. T. Fomenko, V. V. Trofimov, 1988 Second volume in the series translated from the Russian sets out new regular

methods for realizing Hamilton's canonical equations in Lie algebras and symmetric spaces Begins by constructing the algebraic embeddings in Lie algebras of Hamiltonian systems going on to present effective methods for constructing complete sets of functions in involution on orbits of coadjoint representations of Lie groups Ends with the proof of the full integrability of a wide range of many parameter families of Hamiltonian systems that allow algebraicization Annotation copyrighted by Book News Inc Portland OR

Non-commutative Geometry in Mathematics and Physics Giuseppe Dito, 2008 This volume represents the proceedings of the conference on Topics in Deformation Quantization and Non Commutative Structures held in Mexico City in September 2005 It contains survey papers and original contributions by various experts in the fields of deformation quantization and non commutative derived algebraic geometry in the interface between mathematics and physics It also contains an article based on the XI Memorial Lectures given by M Kontsevich which were delivered as part of the conference This is an excellent introductory volume for readers interested in learning about quantization as deformation Hopf algebras and Hodge structures in the framework of non commutative algebraic geometry

Integrable Hamiltonian Hierarchies Vladimir Gerdjikov, Gaetano Vilasi, Alexandar Borisov Yanovski, 2008-06-02 This book presents a detailed derivation of the spectral properties of the Recursion Operators allowing one to derive all the fundamental properties of the soliton equations and to study their hierarchies

Algebraic Aspects of Darboux Transformations, Quantum Integrable Systems and Supersymmetric Quantum Mechanics Primitivo B. Acosta Humanez, 2012 This volume represents the 2010 Jairo Charris Seminar in Algebraic Aspects of Darboux Transformations Quantum Integrable Systems and Supersymmetric Quantum Mechanics which was held at the Universidad Sergio Arboleda in Santa Marta Colombia The papers cover the fields of Supersymmetric Quantum Mechanics and Quantum Integrable Systems from an algebraic point of view Some results presented in this volume correspond to the analysis of Darboux Transformations in higher order as well as some exceptional orthogonal polynomials The reader will find an interesting Galois approach to study finite gap potentials This book is published in cooperation with Instituto de Matematicas y sus Aplicaciones IMA

The Versatility of Integrability Mikhail Bershtein, Anton Dzhamay, Andrei Okounkov, 2025-08-06 This volume contains the proceedings of IDPEIS 22 Isomonodromic Deformations Painlevé Equations and Integrable Systems held virtually June 27 July 1 2022 hosted by Columbia University and AGMPS 22 Algebraic Geometry Mathematical Physics and Solitons held October 7 9 2022 at Columbia University New York NY This volume is dedicated to the legacy of Igor Krichever and the papers in it are closely connected to the main themes of Igor's research interests The range of topics in this volume is very broad The paper by Bobenko Bobenko and Suris generalizes Krichever's approach to algebro geometric integrability to the dimer models The paper by Rhrle and Zakharov considers a tropical version of classical algebro geometric objects such as the Prym variety The papers by Grekov and Nekrasov and by Felder Smirnov Tarasov and Varchenko study quantum integrable systems from the point of view of 3D mirror symmetry and gauge theories The paper by Etingof and Varchenko studies properties of certain

families of flat connections and the paper by Yamada describes a Lax form of a quantum q Painlevé equation. The paper by Cherednik belongs to the area of combinatorial probability and the paper by Braverman and Kazhdan to the geometric Langlands program. The two remaining papers are in the area of applied mathematics. The paper by de Leon, Frauendiener and Klein considers the computational approach to the Schotky problem. The paper by Blackstone, Gassot and Miller studies soliton ensembles for the Benjamin-Ono equation.

Integrable Systems, Topology, and Physics Martin A. Guest, Reiko Miyaoka, Yoshihiro Ohnita, 2002. Ideas and techniques from the theory of integrable systems are playing an increasingly important role in geometry. Thanks to the development of tools from Lie theory, algebraic geometry, symplectic geometry and topology, classical problems are investigated more systematically. New problems are also arising in mathematical physics. A major international conference was held at the University of Tokyo in July 2000. It brought together scientists in all of the areas influenced by integrable systems. This book is the second of three collections of expository and research articles. This volume focuses on topology and physics. The role of zero curvature equations outside of the traditional context of differential geometry has been recognized relatively recently but it has been an extraordinarily productive one and most of the articles in this volume make some reference to it. Symplectic geometry, Floer homology, twistor theory, quantum cohomology and the structure of special equations of mathematical physics such as the Toda field equations all of these areas have gained from the integrable systems point of view and contributed to it. Many of the articles in this volume are written by prominent researchers and will serve as introductions to the topics. It is intended for graduate students and researchers interested in integrable systems and their relations to differential geometry, topology, algebraic geometry and physics. The first volume from this conference also available from the AMS is *Differential Geometry and Integrable Systems* Volume 308 CONM 308 in the Contemporary Mathematics series. The forthcoming third volume will be published by the Mathematical Society of Japan and will be available outside of Japan from the AMS in the Advanced Studies in Pure Mathematics series.

The Geometrical Study of Differential Equations Joshua Allensworth, Leslie, Thierry P. Robart, 2001. This volume contains papers based on some of the talks given at the NSF/CBMS conference on The Geometrical Study of Differential Equations held at Howard University, Washington DC. The collected papers present important recent developments in this area including the treatment of nontransversal group actions in the theory of group invariant solutions of PDEs, a method for obtaining discrete symmetries of differential equations, the establishment of a group invariant version of the variational complex based on a general moving frame construction, the introduction of a new variational complex for the calculus of difference equations and an original structural investigation of Lie-Bäcklund transformations. The book opens with a modern and illuminating overview of Lie's line-sphere correspondence and concludes with several interesting open problems arising from symmetry analysis of PDEs. It offers a rich source of inspiration for new or established researchers in the field. This book can serve nicely as a companion volume to a forthcoming book written by the principle speaker at the conference, Professor Niky

Kamran to be published in the AMS series CBMS Regional Conference Series in Mathematics

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