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An Introduction to Lie Groups and Lie Algebras Cambridge University Press
The representation theory of the symmetric groups is a classical topic that, since the pioneering work of Frobenius, Schur and Young, has grown into a huge body of theory, with many important connections to other areas of mathematics and physics. This self-contained book provides a detailed introduction to the subject, covering classical topics such as the Littlewood – Richardson rule and the Schur – Weyl duality. Importantly the authors also present many recent advances in the area, including Lassalle's character formulas, the theory of partition algebras, and an exhaustive exposition of the approach developed by A. M. Vershik and A. Okounkov. A wealth of examples and exercises makes this an ideal textbook for graduate students. It will also serve as a useful reference for more experienced researchers across a range of areas, including algebra, computer science, statistical mechanics and theoretical physics.

Recent Developments in the Inverse Galois Problem Cambridge University Press
A concise and accessible introduction to the wide range of topics in geometric approaches to differential equations.

Galois Groups and Fundamental Groups Cambridge University Press
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Representation Theory of the Symmetric Groups Springer Science & Business Media
The volume is a follow-up to the INdAM meeting “ Special metrics and quaternionic geometry ” held in Rome in November 2015. It offers a panoramic view of a selection of cutting-edge topics in differential geometry, including 4-manifolds, quaternionic and octonionic geometry, twistor spaces, harmonic maps, spinors, complex and conformal geometry, homogeneous spaces and nilmanifolds, special geometries in dimensions 5 – 8, gauge theory, symplectic and toric manifolds, exceptional holonomy and integrable systems. The workshop was held in honor of Simon Salamon, a leading international scholar at the forefront of academic research who has made significant contributions to all these subjects. The articles published here represent a compelling testimony to Salamon ’ s profound and longstanding impact on the mathematical community. Target readership includes graduate students and researchers working in Riemannian and complex geometry, Lie theory and mathematical physics.

Geometric Analysis Cambridge University Press
The synthesis of symplectic geometry, the calculus of variations and control theory offered in this book provides a crucial foundation for the understanding of many problems in applied mathematics. Focusing on the theory of integrable systems, this book introduces a class of optimal control problems on Lie groups, whose Hamiltonians, obtained through the Maximum Principle of optimality, shed new light on the theory of integrable systems. These Hamiltonians provide an original and unified account of the existing theory of integrable systems. The book particularly explains much of the mystery surrounding the Kepler problem, the Jacobi problem and the Kovalevskaya Top. It also reveals the ubiquitous presence of elastic curves in integrable systems up to the soliton solutions of the non-linear Schroedinger's equation. Containing a useful blend of theory and applications, this is an indispensable guide for graduates and researchers in many fields, from mathematical physics to space control.

Special Metrics and Group Actions in Geometry Cambridge University Press
The focus of this book is on algebro-geometric solutions of completely integrable nonlinear partial differential equations in (1+1)-dimensions, also known as soliton equations. Explicitly treated integrable models include the KdV, AKNS, sine-Gordon, and Camassa-Holm hierarchies as well as the classical massive Thirring system. An extensive treatment of the class of algebro-geometric solutions in the stationary as well as time-dependent contexts is provided. The formalism presented includes trace formulas, Dubrovin-type initial value problems, Baker-Akhiezer functions, and theta function representations of all relevant quantities involved. The book uses techniques from the theory of differential equations, spectral analysis, and elements of algebraic geometry (most notably, the theory of compact Riemann surfaces). The presentation is rigorous, detailed, and self-contained, with ample background material provided in various appendices. Detailed notes for each chapter together with an exhaustive bibliography enhance the presentation offered in the main text.

Galois Groups and Fundamental Groups Cambridge University Press
One of modern science's most famous and controversial figures, Jerzy Plebanski was an outstanding theoretical physicist and an author of many intriguing discoveries in general relativity and quantum theory. Known for his exceptional analytic talents, explosive character, inexhaustible energy, and bohemian nights with brandy, coffee, and enormous amounts of cigarettes, he was dedicated to both science and art, producing innumerable handwritten articles - resembling monk's calligraphy - as well as a collection of oil paintings. As a collaborator but also an antagonist of Leopold Infeld's (a coauthor of Albert Einstein's), Plebanski is recognized for designing the "heavenly" and "hyper-heavenly" equations, for introducing new variables to describe the gravitational field, for the exact solutions in Einstein's gravity and in quantum theory, for his classification of the tensor of matter, for some outstanding results in nonlinear electrodynamics, and for analyzing general relativity with continuous sources long before Chandrasekhar et al. A tribute to Plebaski's contributions and the variety of his interests, this is a unique and wide-ranging collection of invited papers, covering gravity quantization, strings, branes, supersymmetry, ideas on the deformation quantization, and lesser known results on the continuous Baker-Campbell-Hausdorff problem.

Modeling Complex Data for Creating Information Cambridge University Press
This volume assembles several research papers in all areas of geometric and combinatorial group theory originated in the recent conferences in Dortmund and Ottawa in 2007. It contains high quality refereed articles developing new aspects of these modern and active fields in mathematics. It is also appropriate to advanced students interested in recent results at a research level.

Proceedings of Groups - St. Andrews 1985 Cambridge University Press
J.-E DUBOIS and N. GERSHON As with Volume 1 in this series, this book was inspired by the Symposium on "Communications and Computer Aided Systems" held at the 14th International CODATA Conference in September 1994 in Chambery, France. This book was conceived and influenced by the discussions at the Symposium and most of the contributions were written following the Conference. Whereas the first volume dealt with the numerous challenges facing the information revolution, especially its communication aspects, this one provides an insight into the recent tools provided by computer science for handling the complex aspects of scientific and technological data. This volume, "Modeling Complex Data for Creating Information," is concerned with real and virtual objects often involved with data handling processes encountered frequently in modeling physical phenomena and systems behavior. Topics concerning modeling complex data for creating information include: • Object oriented approach for structuring data and knowledge • Imprecision and uncertainty in information systems • Fractal modeling and shape and surface processing • Symmetry applications for molecular data The choice of these topics reflects recent developments in information systems technologies. One example is object oriented technology. Recently, research, development and applications have been using object-oriented modeling for computer handling of data and data management. Object oriented technology offers increasingly easy-to-use software applications and operating systems. As a result, science and technology research and applications can now provide more flexible and effective services.

Automorphic Representations and L-Functions for the General Linear Group: Cambridge University Press
This memoir develops the spectral theory of the Lax operators of nonlinear Schrodinger-like partial differential equations with periodic boundary conditions. Their spectral curves, i.e., the common spectrum with the periodic shifts, are generically Riemann surfaces of infinite genus. The points corresponding to infinite energy are added. The resulting spaces are no longer Riemann surfaces in the usual sense, but they are quite similar to compact Riemann surfaces. In fact, some of the basic tools of the theory of compact Riemann surfaces are generalized to these spectral curves and illuminate the structure of complete integrability: The eigen bundles define holomorphic line bundles on the spectral curves, which completely determine the potentials. These line bundles may be described by divisors of the same degree as the genus, and these divisors give rise to Darboux coordinates. With the help of a Riemann-Roch Theorem, the isospectral sets (the sets of all potentials corresponding to the same spectral curve) may be identified with open dense subsets of the Jacobian varieties. The real parts of the isospectral sets are infinite dimensional tori, and the group action solves the corresponding nonlinear partial differential equations. Deformations of the spectral curves are in one to one correspondence with holomorphic forms. Serre Duality reproduces the symplectic form.

Mathematical Aspects of Quantum Field Theory Springer Science & Business Media
This graduate-level textbook provides an elementary exposition of the theory of automorphic representations and L-functions for the general linear group in an adelic setting. Definitions are kept to a minimum and repeated when reintroduced so that the book is accessible from any entry point, and with no prior knowledge of representation theory. The book includes concrete examples of global and local representations of GL(n), and presents their associated L-functions. In Volume 1, the theory is developed from first principles for GL(1), then carefully extended to GL(2) with complete detailed proofs of key theorems. Several proofs are presented for the first time, including Jacquet's simple and elegant proof of the tensor product theorem. In Volume 2, the higher rank situation of GL(n) is given a detailed treatment. Containing numerous exercises by Xander Faber, this book will motivate students and researchers to begin working in this fertile field of research.

An Outline of Ergodic Theory Springer Science & Business Media
Ever since the concepts of Galois groups in algebra and fundamental groups in topology emerged during the nineteenth century, mathematicians have known of the strong analogies between the two concepts. This book presents the connection starting at an elementary level, showing how the judicious use of algebraic geometry gives access to the powerful interplay between algebra and topology that underpins much modern research in geometry and number theory. Assuming as little technical background as possible, the book starts with basic algebraic and topological concepts, but already presented from the modern viewpoint advocated by Grothendieck. This enables a systematic yet accessible development of the theories of fundamental groups of algebraic curves, fundamental groups of schemes, and Tannakian fundamental groups. The connection between fundamental groups and linear differential equations is also developed at increasing levels of generality. Key applications and recent results, for example on the inverse Galois problem, are given throughout.
Representations of Groups Cambridge University Press
Rough path analysis provides a fresh perspective on Ito's important theory of stochastic differential equations. Key theorems of modern stochastic analysis (existence and limit theorems for stochastic flows, Freidlin-Wentzell theory, the Stroock-Varadhan support description) can be obtained with dramatic simplifications. Classical approximation results and their limitations (Wong-Zakai, McShane's counterexample) receive 'obvious' rough path explanations. Evidence is building that rough paths will play an important role in the future analysis of stochastic partial differential equations and the authors include some first results in this direction. They also emphasize interactions with other parts of mathematics, including Caratheodory geometry, Dirichlet forms and Malliavin calculus. Based on successful courses at the graduate level, this up-to-date introduction presents the theory of rough paths and its applications to stochastic analysis. Examples, explanations and exercises make the book accessible to graduate students and researchers from a variety of fields.
Topics in Differential Geometry Cambridge University Press
A current picture of progress and research in group theory is provided by five leading group theorists Bachmuth, Baumslag, Neumann, Roseblade and Tits.
Integrable Systems and Riemann Surfaces of Infinite Genus American Mathematical Soc.
This informal introduction provides a fresh perspective on isomorphism theory, which is the branch of ergodic theory that explores the conditions under which two measure preserving systems are essentially equivalent. It contains a primer in basic measure theory, proofs of fundamental ergodic theorems, and material on entropy, martingales, Bernoulli processes, and various varieties of mixing. Original proofs of classic theorems - including the Shannon–McMillan–Breiman theorem, the Krieger finite generator theorem, and the Ornstein isomorphism theorem - are presented by degrees, together with helpful hints that encourage the reader to develop the proofs on their own. Hundreds of exercises and open problems are also included, making this an ideal text for graduate courses. Professionals needing a quick review, or seeking a different perspective on the subject, will also value this book.
Linear Algebraic Groups and Finite Groups of Lie Type Cambridge University Press
Originating from a summer school taught by the authors, this concise treatment includes many of the main results in the area. An introductory chapter describes the fundamental results on linear algebraic groups, culminating in the classification of semisimple groups. The second chapter introduces more specialized topics in the subgroup structure of semisimple groups and describes the classification of the maximal subgroups of the simple algebraic groups. The authors then systematically develop the subgroup structure of finite groups of Lie type as a consequence of the structural results on algebraic groups. This approach will help students to understand the relationship between these two classes of groups. The book covers many topics that are central to the subject, but missing from existing textbooks. The authors provide numerous instructive exercises and examples for those who are learning the subject as well as more advanced topics for research students working in related areas.
Dynamics of Satellites (1969) Cambridge University Press
In this book, the topics are presented in the same order as in the textbook. The problems concern two content areas: Linear Algebra, and Analytical Geometry. After reading this book, a student should be ables to solve linear equations and to perform the basic operations on numbers and algebraic expressions. The Linear Algebra tests will reveal readers' knowledge and skills, readers' abilities in interpreting symbols, justifying statements and constructing proofs. Readers should be able to apply the properties of determinants and matrix operations and solve linear systems of equations. The Analytical Geometry topics include different forms of equations of straight lines and planes; angles between simple figures; the curves of the second order. This book will prove definitive and ideal reference tool to research scholars, academicians and educationists.
Inverse Galois Theory World Scientific
On its original publication, this algebraic introduction to Grothendieck's local cohomology theory was the first book devoted solely to the topic and it has since become the standard reference for graduate students. This second edition has been thoroughly revised and updated to incorporate recent developments in the field.
p-adic Differential Equations Cambridge University Press
From the reviews: "... The book under review consists of two monographs on geometric aspects of group theory ... Together, these two articles form a wide-ranging survey of combinatorial group theory, with emphasis very much on the geometric roots of the subject. This will be a useful reference work for the expert, as well as providing an overview of the subject for the outsider or novice. Many different topics are described and explored, with the main results presented but not proved. This allows the interested reader to get the flavour of these topics without becoming bogged down in detail. Both articles give comprehensive bibliographies, so that it is possible to use this book as the starting point for a more detailed study of a particular topic of interest. ..." Bulletin of the London Mathematical Society, 1996
Local Cohomology Courier Corporation
In this paper, the author studies all the elliptic integrable systems, in the sense of C, that is to say, the family of all the m-th elliptic integrable systems associated to a $k^\prime$-symmetric space $N=G/G_0$. The author describes the geometry behind this family of integrable systems for which we know how to construct (at least locally) all the solutions. The introduction gives an overview of all the main results, as well as some related subjects and works, and some additional motivations.