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KEY=GROUP - BURCH NATHEN

SPECIAL FUNCTIONS AND THE THEORY OF GROUP REPRESENTATIONS

American Mathematical Soc.

SPECIAL FUNCTIONS: GROUP THEORETICAL ASPECTS AND APPLICATIONS

Springer Science & Business Media Approach your problems from It isn't that they can't see the right end and begin with the solution. the answers. Then one day, It is that they can't see the perhaps you will find the problem. final question. G.K. Chesterton. The Scandal 'The Hermit Clad in Crane of Father Brown 'The Point of Feathers' in R. van Gulik's a Pin'. The Chinese Maze Murders. Growing specialization and diversification have brought a host of monographs and textbooks on increasingly specialized topics. However, the "tree" of knowledge of mathematics and related fields does not grow only by putting forth new branches. It also happens, quite often in fact, that branches which were thought to be completely disparate are suddenly seen to be related. Further, the kind and level of sophistication of mathematics applied in various sciences has changed drastically in recent years: measure theory is used (non-trivially) in regional and theoretical economics; algebraic geometry interacts with physics; the Minkowsky lemma, coding theory and the structure of water meet one another in packing and covering theory; quantum fields, crystal defects and mathematical programming profit from homotopy theory; Lie algebras are relevant to filtering; and prediction and electrical engineering can use Stein spaces. And in addition to this there are such new emerging SUBdisciplines as "completely integrable systems", "chaos, synergetics and large-scale order", which are almost impossible to fit into the existing classification schemes. They draw upon widely different sections of mathematics.

SPECIAL FUNCTIONS AND THE THEORY OF GROUP REPRESENTATIONS

American Mathematical Soc. A standard scheme for a relation between special functions and group representation theory is the following: certain classes of special functions are interpreted as matrix elements of irreducible representations of a certain Lie group, and then properties of special functions are related to (and derived from) simple well-known facts of representation theory. The book combines the majority of known results in this direction. In particular, the author describes connections between the exponential functions and the additive group of real numbers (Fourier analysis), Legendre and Jacobi polynomials and representations of the group $SU(2)$, and the hypergeometric function and representations of the group $SL(2, R)$, as well as many other classes of special functions.

SPECIAL FUNCTIONS AND THE THEORY OF GROUP REPRESENTATIONS

REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

VOLUME 3: CLASSICAL AND QUANTUM GROUPS AND SPECIAL FUNCTIONS

Springer Science & Business Media This is the last of three major volumes which present a comprehensive treatment of the theory of the main classes of special functions from the point of view of the theory of group representations. This volume deals with q-analogs of special functions, quantum groups and algebras (including Hopf algebras), and (representations of) semi-simple Lie groups. Also treated are special functions of a matrix argument, representations in the Gel'fand-Tsetlin basis, and, finally, modular forms, theta-functions and affine Lie algebras. The volume builds upon results of the previous two volumes, and presents many new results. Subscribers to the complete set of three volumes will be entitled to a discount of 15%.

REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

SIMPLEST LIE GROUPS, SPECIAL FUNCTIONS, AND INTEGRAL TRANSFORMS

Springer Science & Business Media One service mathematici has rendered the 'Et moi, ...• si j'avait IU comment en revenir. je n'y serais point alle.' human race. It has put common sense back Jules Verne where it belong., on the topmost shelf next to the dusty canister labelled 'discarded non- The series is divergent; therefore we may be sense', Eric T. Bell able to do something with it. O. H eavside Mathematics is a tool for thought. A highly necessary tool in a world where both feedback and non linearities abound. Similarly, all kinds of parts of mathematics serve as tools for other pans and for other sciences. Applying a simple rewriting rule to the quote on the right above one finds such statements as: 'One service topology has rendered mathematical physics .. .'; 'One service logic has rendered com puter science .. .'; 'One service category theory has rendered mathematics .. .'. All arguably true. And all statements obtainable this way form part of the raison d'el;re of this series.

SPECIAL FUNCTIONS AND THE THEORY OF GROUP REPRESENTATIONS

REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

RECENT ADVANCES

Springer Science & Business Media In 1991-1993 our three-volume book "Representation of Lie Groups and Spe cial Functions" was published. When we started to write that book (in 1983), editors of "Kluwer Academic Publishers" expressed their wish for the book to be of encyclopaedic type on the subject. Interrelations between representations of Lie groups and special functions are very wide. This width can be explained by existence of different types of Lie groups and by richness of the theory of their rep resentations. This is why the book, mentioned above, spread to three big volumes. Influence of representations of Lie groups and Lie algebras upon the theory of special functions is lasting. This theory is developing further and methods of the representation theory are of great importance in this development. When the book "Representation of Lie Groups and Special Functions" ,vol. 1-3, was under preparation, new directions of the theory of special functions, connected with group representations, appeared. New important results were discovered in the traditional directions. This impelled us to write a continuation of our three-volume book on relationship between representations and special functions. The result of our further work is the present book. The three-volume book, published before, was devoted mainly to studying classical special functions and orthogonal polynomials by means of matrix elements, Clebsch-Gordan and Racah coefficients of group representations and to generaliza tions of classical special functions that were dictated by matrix elements of repre sentations.

SPECIAL FUNCTIONS AND LINEAR REPRESENTATIONS OF LIE GROUPS

American Mathematical Soc.

SPECIAL FUNCTIONS

A GROUP THEORETIC APPROACH

THEORY AND APPLICATIONS OF SPECIAL FUNCTIONS

A VOLUME DEDICATED TO MIZAN RAHMAN

Springer Science & Business Media A collection of articles on various aspects of q-series and special functions dedicated to Mizan Rahman. It also includes an article by Askey, Ismail, and Koelink on Rahman's mathematical contributions and how they influenced the recent upsurge in the subject.

FROM GAUSS TO PAINLEVÉ

A MODERN THEORY OF SPECIAL FUNCTIONS

Vieweg+Teubner Verlag This book gives an introduction to the modern theory of special functions. It focuses on the nonlinear Painlevé differential equation and its solutions, the so-called Painlevé functions. It contains modern treatments of the Gauss hypergeometric differential equation, monodromy of second order Fuchsian equations and nonlinear differential equations near singular points. The book starts from an elementary level requiring only basic notions of differential equations, function theory and group theory. Graduate students should be able to work with the text. "The authors do an excellent job of presenting both the historical and mathematical details of the subject in a form accessible to any mathematician or physicist." (MPR in "The American Mathematical Monthly" März 1992.

GROUP THEORY IN PHYSICS

World Scientific An introductory text book for graduates and advanced undergraduates on group representation theory. It emphasizes group theory's role as the mathematical framework for describing symmetry properties of classical and quantum mechanical systems. Familiarity with basic group concepts and techniques is invaluable in the education of a modern-day physicist. This book emphasizes general features and methods which demonstrate the power of the group-theoretical approach in exposing the systematics of physical systems with associated symmetry. Particular attention is given to pedagogy. In developing the theory, clarity in presenting the main ideas and consequences is given the same priority as comprehensiveness and strict rigor. To preserve the integrity of the mathematics, enough technical information is included in the appendices to make the book almost self-contained. A set of problems and solutions has been published in a separate booklet.

REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

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REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

RECENT ADVANCES

Springer Science & Business Media The present book is a continuation of the three-volume work Representation of Lie Groups and Special Functions by the same authors. Here, they deal with the exposition of the main new developments in the contemporary theory of multivariate special functions, bringing together material that has not been presented in monograph form before. The theory of orthogonal symmetric polynomials (Jack polynomials, Macdonald's polynomials and others) and multivariate hypergeometric functions associated to symmetric polynomials are treated. Multivariate hypergeometric functions, multivariate Jacobi polynomials and h-harmonic polynomials connected with root systems and Coxeter groups are introduced. Also, the theory of Gel'fand hypergeometric functions and the theory of multivariate hypergeometric series associated to Clebsch-Gordan coefficients of the unitary group $U(n)$ is given. The volume concludes with an extensive bibliography. For research mathematicians and physicists, postgraduate students in

mathematics and mathematical and theoretical physics.

FROM GAUSS TO PAINLEVÉ

A MODERN THEORY OF SPECIAL FUNCTIONS

Springer Science & Business Media This book gives an introduction to the modern theory of special functions. It focuses on the nonlinear Painlevé differential equation and its solutions, the so-called Painlevé functions. It contains modern treatments of the Gauss hypergeometric differential equation, monodromy of second order Fuchsian equations and nonlinear differential equations near singular points. The book starts from an elementary level requiring only basic notions of differential equations, function theory and group theory. Graduate students should be able to work with the text. "The authors do an excellent job of presenting both the historical and mathematical details of the subject in a form accessible to any mathematician or physicist." (MPR in "The American Mathematical Monthly" März 1992.)

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GROUP THEORY IN PHYSICS

AN INTRODUCTION TO SYMMETRY PRINCIPLES, GROUP REPRESENTATIONS, AND SPECIAL FUNCTIONS IN CLASSICAL AND QUANTUM PHYSICS

World Scientific Publishing Company An introductory text book for graduates and advanced undergraduates on group representation theory. It emphasizes group theory's role as the mathematical framework for describing symmetry properties of classical and quantum mechanical systems. Familiarity with basic group concepts and techniques is invaluable in the education of a modern-day physicist. This book emphasizes general features and methods which demonstrate the power of the group-theoretical approach in exposing the systematics of physical systems with associated symmetry. Particular attention is given to pedagogy. In developing the theory, clarity in presenting the main ideas and consequences is given the same priority as comprehensiveness and strict rigor. To preserve the integrity of the mathematics, enough technical information is included in the appendices to make the book almost self-contained. A set of problems and solutions has been published in a separate booklet. Request Inspection Copy

HARMONIC ANALYSIS AND SPECIAL FUNCTIONS ON SYMMETRIC SPACES

Academic Press The two parts of this sharply focused book, Hypergeometric and Special Functions and Harmonic Analysis on Semisimple Symmetric Spaces, are derived from lecture notes for the European School of Group Theory, a forum providing high-level courses on recent developments in group theory. The authors provide students and researchers with a thorough and thoughtful overview, elaborating on the topic with clear statements of definitions and theorems and augmenting these with time-saving examples. An extensive set of notes supplements the text. Heckman and Schlichtkrull extend the ideas of harmonic analysis on semisimple symmetric spaces to embrace the theory of hypergeometric and spherical functions and show that the K-variant Eisenstein integrals for G/H are hypergeometric functions under this theory. They lead readers from the fundamentals of semisimple symmetric spaces of G/H to the frontier, including generalization, to the Riemannian case. This volume will interest harmonic analysts, those working on or applying the theory of symmetric spaces; it will also appeal to those with an interest in special functions. Extends ideas of harmonic analysis on symmetric spaces First treatment of the theory to include hypergeometric and spherical functions Links algebraic, analytic, and geometric methods

INVARIANT RANDOM FIELDS ON SPACES WITH A GROUP ACTION

Springer Science & Business Media The author describes the current state of the art in the theory of invariant random fields. This theory is based on several different areas of mathematics, including probability theory, differential geometry, harmonic analysis, and special functions. The present volume unifies many results scattered throughout the mathematical, physical, and engineering literature, as well as it introduces new results from this area first proved by the author. The book also presents many practical applications, in particular in such highly interesting areas as approximation theory, cosmology and earthquake engineering. It is intended for researchers and specialists working in the fields of stochastic processes, statistics, functional analysis, astronomy, and engineering.

ENCYCLOPAEDIA OF MATHEMATICS

SUPPLEMENT VOLUME I

Springer Science & Business Media This is the first Supplementary volume to Kluwer's highly acclaimed Encyclopaedia of Mathematics. This additional volume contains nearly 600 new entries written by experts and covers developments and topics not included in the already published 10-volume set. These entries have been arranged alphabetically throughout. A detailed index is included in the book. This Supplementary volume enhances the existing 10-volume set. Together, these eleven volumes represent the most authoritative, comprehensive up-to-date Encyclopaedia of Mathematics available.

INTEGRABILITY, SUPERSYMMETRY AND COHERENT STATES

A VOLUME IN HONOUR OF PROFESSOR VÉRONIQUE HUSSIN

Springer This volume shares and makes accessible new research lines and recent results in several branches of theoretical and mathematical physics, among them Quantum Optics, Coherent States, Integrable Systems, SUSY Quantum Mechanics, and Mathematical Methods in Physics. In addition to a selection of the contributions presented at the "6th International Workshop on New Challenges in Quantum Mechanics: Integrability and Supersymmetry", held in Valladolid, Spain, 27-30 June 2017, several high quality contributions from other authors are also included. The conference gathered 60 participants from many countries working in different fields of Theoretical Physics, and was dedicated to Prof. Véronique Hussin—an internationally recognized expert in many branches of Mathematical Physics who has been making remarkable contributions to this field since the 1980s. The reader will find interesting reviews on the main topics from internationally recognized experts in each field, as well as other original contributions, all of which deal with recent applications or discoveries in the aforementioned areas.

SYMMETRIES AND INTEGRABILITY OF DIFFERENCE EQUATIONS

American Mathematical Soc.

ON LIE ALGEBRAS AND SOME SPECIAL FUNCTIONS OF MATHEMATICAL PHYSICS

The factorization method for second order ordinary differential equations is shown to be related to the representation theory of four Lie algebras: the Lie algebras of the Euclidean groups in 2 and 3-space, the Lie algebra of the rotation group in 3-space, and a certain 4-dimensional solvable Lie algebra. Recursion relations and generating functions for the hypergeometric, confluent hypergeometric, Bessel, and parabolic cylinder functions are obtained directly from the commutation relations of these Lie algebras. To a considerable degree, the Lie algebraic approach unifies the theory of these special functions.

LIE THEORY AND SPECIAL FUNCTIONS

Academic Press Lie Theory and Special Functions

SPECIAL FUNCTIONS

Cambridge University Press An overview of special functions, focusing on the hypergeometric functions and the associated hypergeometric series.

GROUP REPRESENTATIONS AND SPECIAL FUNCTIONS

EXAMPLES AND PROBLEMS PREPARED BY ALEKSANDER STRASBURGER

Springer Growing specialization and diversification have brought a hor'st of monographs and textbooks on increasingly specialized topics. However, the "tree" of knowledge of mathematics and related fields does not grow only by putting forth new branches. It also happens, quite often in fact, that branches which were thought to be completely disparate are suddenly seen to be related. Further, the kind and level of sophistication of mathematics applied in various sciences has changed drastically in recent years: measure theory is used (non-trivially) in regional and theoretical economics; algebraic geometry interacts with physics; the Minkowsky lemma, coding theory and the structure of water meet one another in packing and covering theory; quantum fields, crystal defects and mathematical programming profit from homotopy theory; Lie algebras are relevant to filtering; and prediction and electrical engineering can use Stein spaces. And in addition to this there are such new emerging subdisciplines as "completely integrable systems", "chaos, synergetics and large-scale order", which are almost impossible to fit into the existing classification schemes. They draw upon widely different sections of mathematics. This programme, Mathematics and Its Applications, is devoted to such (new) interrelations as exempli gratia: - a central concept which plays an important role in several different mathematical and/or scientific specialized areas; - new applications of the results and ideas from one area of scientific endeavor into another; - influences which the results, problems and concepts of one field of enquiry have and have had on the development of another.

REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

VOLUME 3: CLASSICAL AND QUANTUM GROUPS AND SPECIAL FUNCTIONS

Springer Science & Business Media This is the last of three major volumes which present a comprehensive treatment of the theory of the main classes of special functions from the point of view of the theory of group representations. This volume deals with q -analogues of special functions, quantum groups and algebras (including Hopf algebras), and (representations of) semi-simple Lie groups. Also treated are special functions of a matrix argument, representations in the Gel'fand-Tsetlin basis, and, finally, modular forms, theta-functions and affine Lie algebras. The volume builds upon results of the previous two volumes, and presents many new results. Subscribers to the complete set of three volumes will be entitled to a discount of 15%.

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REPRESENTATION OF LIE GROUPS AND SPECIAL FUNCTIONS

VOLUME 1: SIMPLEST LIE GROUPS, SPECIAL FUNCTIONS AND INTEGRAL TRANSFORMS

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THE MATHEMATICAL LEGACY OF WILHELM MAGNUS

GROUPS, GEOMETRY, AND SPECIAL FUNCTIONS : CONFERENCE ON THE LEGACY OF WILHELM MAGNUS, MAY 1-3, 1992, POLYTECHNIC UNIVERSITY, BROOKLYN, NEW YORK

American Mathematical Soc. Wilhelm Magnus was an extraordinarily creative mathematician who made fundamental contributions to diverse areas, including group theory, geometry, and special functions. This book contains the proceedings of a conference held in May 1992 at Polytechnic University to honor the memory of Magnus. The focus of the book is on active areas of current research where Magnus' influence can be seen. The papers range from expository articles to major new research, bringing together seemingly diverse topics and providing entry points to a variety of areas of mathematics.

LIE ALGEBRAS, COHOMOLOGY, AND NEW APPLICATIONS TO QUANTUM MECHANICS,

AMS SPECIAL SESSION ON LIE ALGEBRAS, COHOMOLOGY, AND NEW APPLICATIONS TO QUANTUM MECHANICS, MARCH 20-21, 1992, SOUTHERN MISSOURI STATE UNIVERSITY

American Mathematical Soc. This volume is devoted to a range of important new ideas arising in the applications of Lie groups and Lie algebras to Schrodinger operators and associated quantum mechanical systems. In these applications, the group does not appear as a standard symmetry group, but rather as a "hidden" symmetry group whose representation theory can still be employed to analyze at least part of the spectrum of the operator. In light of the rapid developments in this subject, a Special Session was organized at the AMS meeting at Southwest Missouri State University in March 1992 in order to bring together, perhaps for the first time, mathematicians and physicists working in closely related areas. The contributions to this volume cover Lie group methods, Lie algebras and Lie algebra cohomology, representation theory, orthogonal polynomials, q-series, conformal field theory, quantum groups, scattering theory, classical invariant theory, and other topics. This volume, which contains a good balance of research and survey papers, presents at look at some of the current development in this extraordinarily rich and vibrant area.

SYMMETRIES IN SCIENCE VI

FROM THE ROTATION GROUP TO QUANTUM ALGEBRAS

Springer Science & Business Media The Symposium 'Symmetries in Science VI: From the Rotation Group to Quantum Algebras' was held at the Cloister Mehrerau, Bregenz, Austria, during the period August 2-7, 1992. The Symposium was held in honor of Professor Lawrence C. Biedenharn on the occasion of his 70th birthday. During the academic year 1966/67 I worked as research associate with Larry at Duke University and we have ever since maintained close contact. It was thus natural for me to take the initiative and to organize this Symposium in honor of Larry as a great scientist and friend. The response which the Symposium received showed the favorable reaction by the scientific community to the opportunity provided by the Symposium to honor our colleague, teacher and friend. Equally, the scientific contributions contained in this volume illustrate the high esteem in which he is held. I wish to thank all the scientists who participated in the Symposium and who contributed to this volume. It is due to their commitment that the Symposium was successful. Finally I need to thank those who provided financial and logistical assistance to the Symposium: Dr. John H. Guyon, President of Southern Illinois University at Carbondale, Dr. Russell R. Dutcher, Dean, College of Science at SIUC, Dr. Maurice A. Wright, Chairman, Department of Physics, SIUC, Dr. Victoria J. Molfese, Office of Research Development and Administration, SIUC, as well as Dr. Martin Purtscher, Landeshauptmann, Land Vorarlberg Dr. Guntram Lins, Landesrat, Land Vorarlberg.

SPECIAL FUNCTIONS AND GROUP THEORY IN THEORETICAL PHYSICS

The subject of special functions, even where restricted to the narrower subject of special functions in theoretical physics, is far too broad for one to attempt any meaningfully complete survey. We attempt to review the important main themes in the subject and then show how recent advances broadened and extended these themes.

ORTHOGONAL POLYNOMIALS

THEORY AND PRACTICE

Springer Science & Business Media This volume contains the Proceedings of the NATO Advanced Study Institute on "Orthogonal Polynomials and Their Applications" held at The Ohio State University in Columbus, Ohio, U.S.A. between May 22,1989 and June 3,1989. The Advanced Study Institute primarily concentrated on those aspects of the theory and practice of orthogonal polynomials which surfaced in the past decade when the theory of orthogonal polynomials started to experience an unparalleled growth. This progress started with Richard Askey's Regional Conference Lectures on "Orthogonal Polynomials and Special Functions" in 1975, and subsequent discoveries led to a substantial reevaluation of one's perceptions as to the nature of orthogonal polynomials and their applicability. The recent popularity of orthogonal polynomials is only partially due to Louis de Branges's solution of the Bieberbach conjecture which uses an inequality of Askey and Gasper on Jacobi polynomials. The main reason lies in their wide applicability in areas such as Pade approximations, continued fractions, Tauberian theorems, numerical analysis, probability theory, mathematical statistics, scattering theory, nuclear physics, solid state physics, digital signal processing, electrical engineering, theoretical chemistry and so forth. This was emphasized and convincingly demonstrated during the presentations by both the principal speakers and the invited special lecturers. The main subjects of our Advanced Study Institute included complex orthogonal polynomials, signal processing, the recursion method, combinatorial interpretations of orthogonal polynomials, computational problems, potential theory, Pade approximations, Julia sets, special functions, quantum groups, weighted approximations, orthogonal polynomials associated with root systems, matrix orthogonal polynomials, operator theory and group representations.

GROUPS AND SYMMETRIES

FROM FINITE GROUPS TO LIE GROUPS

Springer Nature - Combines material from many areas of mathematics, including algebra, geometry, and analysis, so students see connections between these areas - Applies material to physics so students appreciate the applications of abstract mathematics - Assumes only linear algebra and calculus, making an advanced subject accessible to undergraduates - Includes 142 exercises, many with hints or complete solutions, so text may be used in the classroom or for self study

SPECIAL FUNCTIONS FOR APPLIED SCIENTISTS

Springer Science & Business Media This book, written by a highly distinguished author, provides the required mathematical tools for researchers active in the physical sciences. The book presents a full suit of elementary functions for scholars at PhD level. The opening chapter introduces elementary classical special functions. The final chapter is devoted to the discussion of functions of matrix argument in the real case. The text and exercises have been class-tested over five different years.

GROUP THEORY IN A NUTSHELL FOR PHYSICISTS

Princeton University Press A concise, modern textbook on group theory written especially for physicists Although group theory is a mathematical subject, it is indispensable to many areas of modern theoretical physics, from atomic physics to condensed matter physics, particle physics to string theory. In particular, it is essential for an understanding of the fundamental forces. Yet until now, what has been missing is a modern, accessible, and self-contained textbook on the subject written especially for physicists. Group Theory in a Nutshell for Physicists fills this gap, providing a user-friendly and classroom-tested text that focuses on those aspects of group theory physicists most need to know. From the basic intuitive notion of a group, A. Zee takes readers all the way up to how theories based on gauge groups could unify three of the four fundamental forces. He also includes a concise review of the linear algebra needed for group theory, making the book ideal for self-study. Provides physicists with a modern and accessible introduction to group theory Covers applications to various areas of physics, including field theory, particle physics, relativity, and much more Topics include finite group and character tables; real, pseudoreal, and complex representations; Weyl, Dirac, and Majorana equations; the expanding universe and group theory; grand unification; and much more The essential textbook for students and an invaluable resource for researchers Features a brief, self-contained treatment of linear algebra An online illustration package is available to professors Solutions manual (available only to professors)

THE APPLICATION OF GROUP THEORY TO THE SPECIAL FUNCTIONS OF MATHEMATICAL PHYSICS

THEORY OF GROUP REPRESENTATIONS AND APPLICATIONS

World Scientific Lie!algebras - Topological!groups - Lie!groups - Representations - Special!functions - Induced!representations.