

# Theory Of Hypergeometric Functions Springer Monographs In Mathematics 2011 Edition By Aomoto Kazuhiko Kita Michitake 2011 Hardcover

Theory and Applications of Special Functions  
 An Algorithmic Approach to Summation and Special Function Identities  
 In Honor of Krishna Alladi's 60th Birthday, University of Florida, Gainesville, March 2016  
 A Volume Dedicated to Mizan Rahman  
 Theory of Hypergeometric Functions  
 Hypergeometric Summation  
 A History of Differential Equations to 1900  
 with Special Emphasis on its Applications  
 On a Class of Incomplete Gamma Functions with Applications  
 An Introduction to Basic Fourier Series  
 Ramanujan: Essays and Surveys  
 Complex Differential and Difference Equations  
 Complex Variables  
 Analysis in Positive Characteristic  
 Encyclopaedia of Mathematics  
 Facets of Algebraic Geometry: Volume 2  
 7th International Conference, Braunschweig, Germany, July 13-16, 2020, Proceedings  
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 Progress in Approximation Theory  
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 Harmony of Gröbner Bases and the Modern Industrial Society  
 Hypergeometric Orthogonal Polynomials and Their  $q$ -Analogues  
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 Use of Mathematical Literature  
 $Q$ -series with Applications to Combinatorics, Number Theory, and Physics  
 Journal of Physics A  
 Vertex Operator Algebras, Number Theory and Related Topics  
 Second Order Differential Equations  
 An International Perspective  
 AMS-IMS-SIAM Joint Summer Research Conference on  $Q$ -Series, Combinatorics, and Computer Algebra, June 21-25, 1998, Mount Holyoke College, South Hadley, MA  
 Generalized Hypergeometric Functions with Applications in Statistics and Physical Sciences  
 The Confluent Hypergeometric Function  
 Physics and Combinatorics  
 A Conference on  $Q$ -series with Applications to Combinatorics, Number Theory, and Physics, October 26-28, 2000, University of Illinois  
 Analytic Number Theory, Modular Forms and  $q$ -Hypergeometric Series  
 Symbolic Computation, Number Theory, Special Functions, Physics and Combinatorics  
 Supplement Volume I

*Theory Of  
Hypergeometric  
Functions Springer  
Monographs In  
Mathematics 2011  
Edition By Aomoto  
Kazuhiko Kita Michitake*

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## **BENJAMIN MOSHE**

*Theory and Applications of Special  
Functions* Springer Science & Business  
Media

The subject of this book is the higher transcendental function known as the confluent hypergeometric function. In the last two decades this function has taken on an ever increasing significance because

of its use in the application of mathematics to physical and technical problems. There is no doubt that this trend will continue until the general theory of confluent hypergeometric functions becomes familiar to the majority of physicists in much the same way as the cylinder functions, which were previously less well known, are now used in many engineering and physical problems. This book is intended to further this development. The important practical significance of the functions which are treated hardly demands an involved discussion since they include, as special cases, a number of simpler special

functions which have long been the everyday tool of the physicist. It is sufficient to mention that these include, among others, the logarithmic integral, the integral sine and cosine, the error integral, the Fresnel integral, the cylinder functions and the cylinder function in parabolic cylindrical coordinates. For anyone who puts forth the effort to study the confluent hypergeometric function in more detail there is the inestimable advantage of being able to understand the properties of other functions derivable from it. This general point of view is particularly useful in connection with series expansions valid for values of the argument near zero or

infinity and in connection with the various integral representations.

*An Algorithmic Approach to Summation and Special Function Identities* Walter de Gruyter GmbH & Co KG

Written to honor the 80th birthday of William Fulton, the articles collected in this volume (the second of a pair) present substantial contributions to algebraic geometry and related fields, with an emphasis on combinatorial algebraic geometry and intersection theory. Featured include commutative algebra, moduli spaces, quantum cohomology, representation theory, Schubert calculus, and toric and tropical geometry. The range of these contributions is a testament to the breadth and depth of Fulton's mathematical influence. The authors are all internationally recognized experts, and include well-established researchers as well as rising stars of a new generation of mathematicians. The text aims to stimulate progress and provide inspiration to graduate students and researchers in the field.

*In Honor of Krishna Alladi's 60th Birthday, University of Florida, Gainesville, March 2016* Springer Science & Business Media  
Significant revision of classic reference in special functions.

A Volume Dedicated to Mizan Rahman  
American Mathematical Soc.

Devoted to counterparts of classical structures of mathematical analysis in analysis over local fields of positive characteristic, this book treats positive characteristic phenomena from an analytic viewpoint. Building on the basic objects introduced by L. Carlitz - such as the Carlitz factorials, exponential and logarithm, and the orthonormal system of Carlitz polynomials - the author develops a kind of differential and integral calculi. He also expands on the basics of an analytic theory of (Carlitz's) differential equations, providing a useful foundation for the study of various special functions. The differential calculus is extended to a type of Rota's umbral calculus, and an investigation is made of the corresponding rings of differential operators. A theory of quasi-holonomic modules over these rings, having some common features with holonomic modules in the sense of Bernstein, is also connected to some special functions in the spirit of Zeilberger's theory.

Theory of Hypergeometric Functions

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Theory of Hypergeometric Functions

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.

Hypergeometric Summation Springer  
Modern algorithmic techniques for summation, most of which were introduced in the 1990s, are developed here and carefully implemented in the computer algebra system Maple™. The algorithms of Fasenmyer, Gosper, Zeilberger, Petkovšek and van Hoeij for hypergeometric summation and recurrence equations, efficient multivariate summation as well as q-analogues of the above algorithms are covered. Similar algorithms concerning differential equations are considered. An equivalent theory of hyperexponential integration due to Almkvist and Zeilberger completes the book. The combination of these results gives orthogonal polynomials and (hypergeometric and q-hypergeometric) special functions a solid algorithmic foundation. Hence, many examples from this very active field are given. The materials covered are suitable for an introductory course on algorithmic summation and will appeal to students and researchers alike.

**A History of Differential Equations to 1900** Springer Science & Business Media  
Gathered from the 2016 Gainesville Number Theory Conference honoring Krishna Alladi on his 60th birthday, these proceedings present recent research in number theory. Extensive and detailed, this volume features 40 articles by leading researchers on topics in analytic number theory, probabilistic number theory, irrationality and transcendence, Diophantine analysis, partitions, basic hypergeometric series, and modular forms. Readers will also find detailed discussions of several aspects of the path-breaking work of Srinivasa Ramanujan and its influence on current research. Many of the papers were motivated by Alladi's own research on partitions and q-series as well as his earlier work in number theory. Alladi is well known for his contributions in number theory and mathematics. His research interests include combinatorics, discrete mathematics, sieve methods, probabilistic and analytic number theory, Diophantine approximations, partitions and q-series identities. Graduate students

and researchers will find this volume a valuable resource on new developments in various aspects of number theory.

**with Special Emphasis on its Applications** Springer

Designed to give a contemporary international survey of research activities in approximation theory and special functions, this book brings together the work of approximation theorists from North America, Western Europe, Asia, Russia, the Ukraine, and several other former Soviet countries. Contents include: results dealing with q-hypergeometric functions, difference hypergeometric functions and basic hypergeometric series with Schur function argument; the theory of orthogonal polynomials and expansions, including generalizations of Szegő type asymptotics and connections with Jacobi matrices; the convergence theory for Padé and Hermite-Padé approximants, with emphasis on techniques from potential theory; material on wavelets and fractals and their relationship to invariant measures and nonlinear approximation; generalizations of de Brange's in equality for univalent functions in a quasi-orthogonal Hilbert space setting; applications of results concerning approximation by entire functions and the problem of analytic continuation; and other topics.

**On a Class of Incomplete Gamma Functions with Applications** World Scientific

The subjects treated in this book have been especially chosen to represent a bridge connecting the content of a first course on the elementary theory of analytic functions with a rigorous treatment of some of the most important special functions: the Euler gamma function, the Gauss hypergeometric function, and the Kummer confluent hypergeometric function. Such special functions are indispensable tools in "higher calculus" and are frequently encountered in almost all branches of pure and applied mathematics. The only knowledge assumed on the part of the reader is an understanding of basic concepts to the level of an elementary course covering the residue theorem, Cauchy's integral formula, the Taylor and Laurent series expansions, poles and essential singularities, branch points, etc. The book addresses the needs of advanced undergraduate and graduate students in mathematics or physics.

**An Introduction to Basic Fourier Series** Cambridge University Press

This volume presents the proceedings of the Joint Summer Research Conference on  $q$ -series, combinatorics, and computer

algebra held at Mount Holyoke College (South Hadley, MA). All of the papers were contributed by participants and offer original research on topics of current interest. Articles in the book reflect the diversity of areas that overlap with  $q$ -series, as well as the usefulness of  $q$ -series across the mathematical sciences. The conference was held in honor of Richard Askey on the occasion of his 65th birthday and the proceedings contain an article about Askey's contributions to special functions.

*Ramanujan: Essays and Surveys* Springer Nature

This book provides an exposition of function field arithmetic with emphasis on recent developments concerning Drinfeld modules, the arithmetic of special values of transcendental functions (such as zeta and gamma functions and their interpolations), diophantine approximation and related interesting open problems. While it covers many topics treated in 'Basic Structures of Function Field Arithmetic' by David Goss, it complements that book with the inclusion of recent developments as well as the treatment of new topics such as diophantine approximation, hypergeometric functions, modular forms, transcendence, automata and solitons. There is also new work on multizeta values and log-algebraicity. The author has included numerous worked-out examples. Many open problems, which can serve as good thesis problems, are discussed. Contents: Number Fields and Function Fields Drinfeld Modules Explicit Class Field Theory Gauss Sums and Gamma Functions Zeta Functions Higher Rank Theory Higher Dimensions and Geometric Tools Applications to Gauss Sums, Gamma and Zeta Values Diophantine Approximation Transcendence Results Automata and Algebraicity: Applications Readership: Graduate students and researchers in algebra, number theory and geometry.

Keywords: Drinfeld Modules; Motives; Gamma; Zeta; Diophantine

Approximation; Automata; Transcendence; Multizeta; Solitons; Periods Reviews: "It is dense with mathematics, but there is also motivation and discussion. The overall feeling is that of a very helpful survey of a very interesting field." MAA Online Book Review "Thakur's book is a welcome addition to the collection of books on the arithmetic of Drinfeld modules and objects related to them. Written by an expert in the field, the book's style is generally informal, without compromising rigor. It certainly will be useful to graduate

students wishing to pursue research in the area of function fields, and at the same time it can be used as a reference book. Many of the important results on special values and transcendence are due to Thakur himself, so in many places the reader gets the 'insider's look' on the subject, and sees how the ideas which go into the proofs were gradually developed." *Mathematical Reviews* "Thakur's book is a valuable contribution to the theory of arithmetic function fields ... The author has included several interesting examples and discusses many open problems." *Zentralblatt MATH* 'Complex Differential and Difference Equations' Springer Science & Business Media

*Novel Electronic Structure Theory: General Innovations and Strongly Correlated Systems, Volume 76*, the latest release in the *Advances in Quantum Chemistry* series presents work and reviews of current work in quantum chemistry (molecules), but also includes scattering from atoms and solid state work of interest in physics. Topics covered in this release include the Present Status of Selected Configuration Interaction with Truncation Energy Error, Recent Developments in Asymptotic Expansions from Numerical Analysis and Approximation Theory, The kinetic energy Pauli enhancement factor and its role in determining the shell structure of atoms and molecules, Numerical Hartree-Fock and Many-Body Calculations for Diatomic Molecules, and more. Provides reports on current work in molecular and atomic quantum mechanics Contains work reported by many of the best scientists in the field Presents the latest release in the *Advances in Quantum Chemistry* series

**Complex Variables** Springer These are the proceedings of the conference "Symbolic Computation, Number Theory, Special Functions, Physics and Combinatorics" held at the Department of Mathematics, University of Florida, Gainesville, from November 11 to 13, 1999. The main emphasis of the conference was Computer Algebra (i. e. symbolic computation) and how it related to the fields of Number Theory, Special Functions, Physics and Combinatorics. A subject that is common to all of these fields is  $q$ -series. We brought together those who do symbolic computation with  $q$ -series and those who need  $q$ -series including workers in Physics and Combinatorics. The goal of the conference was to inform mathematicians and physicists who use  $q$ -series of the latest developments in the field of  $q$ -series and especially how symbolic computation has

aided these developments. Over 60 people were invited to participate in the conference. We ended up having 45 participants at the conference, including six one hour plenary speakers and 28 half hour speakers. There were talks in all the areas we were hoping for. There were three software demonstrations.

Academic Press

*Use of Mathematical Literature* discusses the bibliographic concerns of mathematical literature. The book is comprised of 14 chapters that cover characteristics of mathematical literature and provide reviews of some of the major literature in various mathematical fields. The text first discusses the role of the literature in mathematics, and then proceeds to tackling major organizations, journals, and reference materials. Next, the book provides critical accounts of the major literature in various mathematical fields, such as combinatorics, topology, and mathematical programming. The book will be of great use to students, practitioners, and researchers of mathematics. Other profession handling math literature, such as teachers, librarians, and translators will also find this book invaluable.

*Analysis in Positive Characteristic* Springer Science & Business Media

The subject of special functions is rich and expanding continuously with the emergence of new problems encountered in engineering and applied science applications. The development of computational techniques and the rapid growth in computing power have increased the importance of the special functions and their formulae for analytic representations. However, problems remain, particularly in heat conduction, astrophysics, and probability theory, whose solutions seem to defy even the most general classes of special functions. On a Class of Incomplete Gamma Functions with Applications introduces a class of special functions, developed by the authors, useful in the analytic study of several heat conduction problems. It presents some basic properties of these functions, including their recurrence relations, special cases, asymptotic representations, and integral transform relationships. The authors explore applications of these generalized functions to problems in transient heat conduction, special cases of laser sources, and problems associated with heat transfer in human tissues. They also discuss applications to astrophysics, probability theory, and other problems in theory of functions and present a fundamental solution to time-dependent laser sources

with convective-type boundary conditions. Appendices include an introduction to heat conduction, Fourier conduction, a table of Laplace transforms, and well-known results regarding the improper integrals. Filled with tabular and graphical representations for applications, this monograph offers a unique opportunity to add to your mathematical toolbox a new and useful class of special functions.

### **Encyclopaedia of Mathematics**

Cambridge University Press

The present book is about the Askey scheme and the  $q$ -Askey scheme, which are graphically displayed right before chapter 9 and chapter 14, respectively. The families of orthogonal polynomials in these two schemes generalize the classical orthogonal polynomials (Jacobi, Laguerre and Hermite polynomials) and they have properties similar to them. In fact, they have properties so similar that I am inclined (following Andrews & Askey [34]) to call all families in the  $(q)$ -Askey scheme classical orthogonal polynomials, and to call the Jacobi, Laguerre and Hermite polynomials very classical orthogonal polynomials. These very classical orthogonal polynomials are good friends of mine since from the beginning of my mathematical career. When I was a fresh PhD student at the Mathematical Centre (now CWI) in Amsterdam, Dick Askey spent a sabbatical there during the academic year 1969–1970. He lectured to us in a very stimulating way about hypergeometric functions and classical orthogonal polynomials. Even better, he gave us problems to solve which might be worth a PhD. He also pointed out to us that there was more than just Jacobi, Laguerre and Hermite polynomials, for instance Hahn polynomials, and that it was one of the merits of the Higher Transcendental Functions (Bateman project) that it included some newer stuff like the Hahn polynomials (see [198, §10. 23]).

### **Facets of Algebraic Geometry:**

**Volume 2** Springer

This thesis proposes a new perspective on scattering amplitudes in quantum field theories. Their standard formulation in terms of sums over Feynman diagrams is replaced by a computation of geometric invariants, called intersection numbers, on moduli spaces of Riemann surfaces. It therefore gives a physical interpretation of intersection numbers, which have been extensively studied in the mathematics literature in the context of generalized hypergeometric functions. This book explores physical consequences of this formulation, such as recursion relations, connections to geometry and string theory, as well as a phenomenon called moduli space localization. After reviewing necessary mathematical background, including topology of moduli spaces of Riemann spheres with punctures and its fundamental group, the definition and properties of intersection numbers are presented. A comprehensive list of applications and relations to other objects is given, including those to scattering amplitudes in open- and closed-string theories. The highlights of the thesis are the results regarding localization properties of intersection numbers in two opposite limits: in the low- and the high-energy expansion. In order to facilitate efficient computations of intersection numbers the author introduces recursion relations that exploit fibration properties of the moduli space. These are formulated in terms of so-called braid matrices that encode the information of how points braid around each other on the corresponding Riemann surface. Numerous applications of this approach are presented for computation of scattering amplitudes in various gauge and gravity theories. This book comes with an extensive appendix that gives a pedagogical introduction to the topic of homologies with coefficients in

a local system.

[7th International Conference,](#)

[Braunschweig, Germany, July 13–16, 2020, Proceedings](#) Springer Science & Business Media

This book constitutes the proceedings of the 7th International Conference on Mathematical Software, ICMS 2020, held in Braunschweig, Germany, in July 2020. The 48 papers included in this volume were carefully reviewed and selected from 58 submissions. The program of the 2020 meeting consisted of 20 topical sessions, each of which providing an overview of the challenges, achievements and progress in an environment of mathematical software research, development and use.

[with Special Emphasis on its Applications](#) Springer Science & Business Media

The theory of Gröbner bases is a main tool for dealing with rings of differential operators. This book reexamines the concept of Gröbner bases from the point of view of geometric deformations. The algorithmic methods introduced in this book are particularly useful for studying the systems of multidimensional hypergeometric PDE's introduced by Gelfand, Kapranov, and Zelevinsky. A number of original research results are contained in the book, and many open problems are raised for future research in this rapidly growing area of computational mathematics.

*Information Sources for Research and Development* Springer Science & Business Media

"This book revives and vastly expands the classical theory of resultants and discriminants. Most of the main new results of the book have been published earlier in more than a dozen joint papers of the authors. The book nicely complements these original papers with many examples illustrating both old and new results of the theory."—Mathematical Reviews

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