1 Theta Functions Mit Mathematics

This book is a translation of the earlier book written by Koji Doi and the author, who revised it substantially for this English edition. It offers the basic knowledge of elliptic modular forms necessary to understand recent developments in number theory. It also treats the unit groups of quaternion algebras, rarely dealt with in books; and in the last chapter, Eisenstein series with parameter are discussed following the recent work of Shimura.

This book explores the theory of abelian varieties over the field of complex numbers, explaining both classic and recent results in modern language. The second edition adds five chapters on recent results including automorphisms and vector bundles on abelian varieties, algebraic cycles and the Hodge conjecture. ". . . far more readable than most . . . it is also much more complete." Olivier Debarre in Mathematical Reviews, 1994.

Theta functions were studied extensively by Ramanujan. This book provides a systematic development of Ramanujan’s results and extends them to a general theory. The author’s treatment of the subject is comprehensive, providing a detailed study of theta functions and modular forms for levels up to 12. Aimed at advanced undergraduates, graduate students, and researchers, the organization, user-friendly presentation, and rich source of examples, lends this book to serve as a useful reference, a pedagogical tool, and a stimulus for further research. Topics, especially those discussed in the second half of the book, have been the subject of much recent research; many of which are appearing in book form for the first time. Further results are summarized in the numerous exercises at the end of each chapter.

The editors of the present series had originally intended to publish an integrated work on the history of mathematics in the nineteenth century, passing systemati cally from one discipline to another in some natural order. Circumstances beyond their control, mainly difficulties in choosing authors, led to the abandonment of this plan by the time the second volume appeared. Instead of a unified mono graph we now present to the reader a series of books intended to encompass all the mathematics of the nineteenth century, but not in the order of the accepted classification of the component disciplines. In contrast to the first two books of The Mathematics of the Nineteenth Century, which were divided into chapters, this third volume consists of four parts, more in keeping with the nature of the publication. 1 We recall that the first book contained essays on the history of mathemati 2 cal logic, algebra, number theory, and probability, while the second covered the history of geometry and analytic function theory. In the present third volume the reader will find: 1. An essay on the development of Chebyshev's theory of approximation of functions, later called "constructive function theory" by S. N. Bernshtein. This highly original essay is due to the late N. I. Akhiezer (1901-1980), the author of fundamental discoveries in this area. Akhiezer's text will no doubt attract attention not only from historians of mathematics, but also from many specialists in constructive function theory.

This text is an introduction to harmonic analysis on symmetric spaces, focusing on advanced topics such as higher rank spaces, positive definite matrix space and generalizations. It is intended for beginning graduate students in mathematics or researchers in physics or engineering. As with the introductory book entitled "Harmonic Analysis on Symmetric Spaces - Euclidean Space, the Sphere, and the Poincaré Upper Half Plane, the style is informal with an emphasis on motivation, concrete examples, history, and applications. The symmetric spaces considered here are quotients X=G/K, where G is a non-compact real Lie group, such as the general linear group GL(n,P) of all n x n non-singular real matrices, and K=O(n), the maximal compact subgroup of orthogonal matrices. Other examples are Siegel's upper half "plane" and the quaternionic upper half "plane". In the case of the general linear group, one can identify X with the space Pn of n x n positive definite symmetric matrices. Many corrections and updates have been incorporated in this new edition. Updates include discussions of random matrix theory and quantum chaos, as well as recent research on modular forms and their corresponding L-functions in higher rank. Many applications have been added, such as the solution of the heat equation on Pn, the central limit theorem of Donald St. P. Richards for Pn, results on densest lattice packing of spheres in Euclidean space, and GL(n)-analogs of the Weyl law for eigenvalues of the Laplacian in plane domains. Topics featured throughout the text include inversion formulas for Fourier transforms, central limit theorems, fundamental domains in X for discrete groups ? (such as the modular group GL(n,Z) of n x n matrices with integer entries and determinant ±1), connections with the problem of finding densest lattice packings of spheres in Euclidean space, automorphic forms, Hecke operators, L-functions, and the Selberg trace formula and its applications in spectral theory as well as number theory.

The book is an introduction to the theory of cubic metaplectic forms on the 3-dimensional hyperbolic space and the author's research on cubic metaplectic forms on special linear and symplectic groups of rank 2. The topics include: Kubota and Bass-Milnor-Serre homomorphisms, cubic metaplectic Eisenstein series, cubic theta functions, Whittaker functions. A special method is developed and applied to find Fourier coefficients of the Eisenstein series and cubic theta functions. The book is intended for readers, with beginning graduate-level background, interested in further research in the theory of metaplectic forms and in possible applications.

A Brief Introduction to Theta FunctionsCourier Corporation

A comprehensive graduate-level introduction to classical and contemporary aspects of special functions.

This textbook provides a rigorous analytical treatment of the theory of Maass wave forms. Readers will find this unified presentation invaluable, as it treats Maass wave forms as the central area of interest. Subjects at the cutting edge of research are explored in depth, such as Maass wave forms of real weight and the cohomology attached to Maass wave forms and transfer operators. Because Maass wave forms are given a deep exploration, this book offers an indispensable resource for those entering the field. Early chapters present a brief introduction to the theory of classical modular forms, with an emphasis on objects and results necessary to fully understand later material. Chapters 4 and 5 contain the book’s main focus: L-functions and period functions associated with families of Maass wave forms. Other topics include Maass wave forms of real weight, Maass cusp forms, and weak harmonic Maass wave forms. Engaging exercises appear throughout the book, with solutions available online. On the Theory of Maass Wave Forms is ideal for graduate students and researchers entering the area. Readers in mathematical physics and other related disciplines will find this a useful reference as well. Knowledge of complex analysis, real analysis, and abstract algebra is required.

This volume contains the proceedings of a conference held in Cagliari, Italy, from September 7-10, 2009, to celebrate John C. Wood's 60th birthday. These papers reflect the many facets of the theory of harmonic maps and its links and connections with other topics in Differential and Riemannian Geometry. Two long reports, one on constant mean curvature surfaces by F. Pedit and the other on the construction of harmonic maps by J. C. Wood, open the proceedings. These are followed by a mix of surveys on Prof. Wood's area of expertise: Lagrangian surfaces, biharmonic maps, locally conformally Kahler manifolds and the DDVV conjecture, as well as several research papers on harmonic maps. Other research papers in the volume are devoted to Willmore surfaces, Goldstein-Pedrich flows, contact pairs, prescribed Ricci curvature, conformal fibrations, the Fadeev-Hopf model, the Compact Support Principle and the curvature of surfaces.

This volume, dedicated to the memory of the great American mathematician Bertram Kostant (May 24, 1928 – February 2, 2017), is a collection of 19 invited papers by leading mathematicians working in Lie theory, representation theory, algebra, geometry, and mathematical physics. Kostant's fundamental work in all of these areas has provided deep new insights and connections, and has created new fields of research. This volume features the only published articles of important recent results of the contributors with full details of their proofs. Key topics include: Poisson structures and potentials (A. Alekseev, A. Berenstein, B. Hoffman) Vertex algebras (T. Arakawa, K. Kawasetsu) Modular irreducible representations of semisimple Lie algebras (R. Bezrukavnikov, I. Losev) Asymptotic Hecke algebras (A. Braverman, D. Kazhdan) Tensor categories and quantum groups (A. Davydov, P. Etingof, D. Nikshych) Nil-Hecke algebras and Whittaker D-modules (V. Ginzburg) Toeplitz operators (V. Guillemin, A. Uribe, Z. Wang) Kashiwara crystals (A. Joseph) Characters of highest weight modules (V. Kac, M. Wakimoto) Alcove polytopes (T. Lam, A. Postnikov) Representation theory of quantized Gieseker varieties (I. Losev) Generalized Bruhat cells and integrable systems (J.-H. Liu, Y. Mi) Almost characters (G. Lusztig) Verlinde formulas (E. Meinrenken) Dirac operator and equivariant index (P.-É. Paradan, M. Vergne) Modality of representations and geometry of ?-groups (V. L. Popov) Distributions on homogeneous spaces (N. Ressayre) Reduction of orthogonal representations (J.-P. Serre)

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Modular forms and Jacobi forms play a central role in many areas of mathematics. Over the last 10–15 years, this theory has been extended to certain non-holomorphic functions, the so-called "harmonic Maass forms". The first glimpses of this theory appeared in Ramanujan's enigmatic last letter to G. H. Hardy written from his deathbed. Ramanujan discovered functions he called "mock theta functions" which over eighty years later were recognized as pieces of harmonic Maass forms. This book contains the essential features of the theory of harmonic Maass forms and mock modular forms, together with a wide variety of applications to algebraic number theory, combinatorics, elliptic curves, mathematical physics, quantum modular forms, and representation theory.

The first of three parts comprising Volume 54, the proceedings of the Summer Research Institute on Differential Geometry, held at the University of California, Los Angeles, July 1990 (ISBN for the set is 0-8218-1493-1). Part 1 begins with a problem list by S.T. Yau, successor to his 1980 list (Sem

The Institute for Theoretical and Experimental Physics (ITEP) is internationally recognized for achievements in various branches of theoretical physics. For many years, the seminars at ITEP have been among the main centers of scientific life in Moscow. This volume is a collection of articles by participants of the seminar on mathematical physics that has been held at ITEP since 1983. This is the second such collection; the first was published in the same series, AMS Translations, Series 2, vol. 191. The papers in the volume are devoted to several mathematical topics that strongly influenced modern theoretical physics. Among these topics are cohomology and representations of infinite Lie algebras and superalgebras, Hitchin and Knizhnik-Zamolodchikov-Bernard systems, and the theory of D-modules. The book is intended for graduate students and research mathematicians working in algebraic geometry, representation theory, and mathematical physics.

Serge Lang (1927-2005) was one of the top mathematicians of our time. He was born in Paris in 1927, and moved with his family to California, where he graduated from Beverly Hills High School in 1943. He subsequently graduated from California Institute of Technology in 1946, and received a doctorate from Princeton University in 1951 before holding faculty positions at the University of Chicago and Columbia University (1955-1971). At the time of his death he was professor emeritus of Mathematics at Yale University. An excellent writer, Lang has made innumerable and invaluable contributions in diverse fields of mathematics. He was perhaps best known for his work in number theory and for his mathematics textbooks, including the influential Algebra. He was also a member of the Bourbaki group. He was honored with the Cole Prize by the American Mathematical Society as well as with the Prix Carrière by the French Academy of Sciences. These five volumes collect the majority of his research papers, which range over a variety of topics.

Since its beginnings with Fourier (and as far back as the Babylonian astron omers), harmonic analysis has been developed with the goal of unraveling the mysteries of the physical world of quasars, brain tumors, and so forth, as well as the mysteries of the nonphysical, but no less concrete, world of prime numbers, diophantine equations, and zeta functions. Quoting Courant and Hilbert, in the preface to the first German edition of Methods of Mathematical Physics: "Recent trends and fashions have, however, weakened the connection between mathematics and physics. " Such trends are still in evidence, harmful though they may be. My main motivation in writing these notes has been a desire to counteract this tendency towards specialization and describe appli cations of harmonic analysis in such diverse areas as number theory (which happens to be my specialty), statistics, medicine, geophysics, and quantum physics. I remember being quite surprised to learn that the subject is useful. My graduate eduation was that of the 1960s. The standard mathematics graduate course proceeded from Definition 1. 1. 1 to Corollary 14. 5. 59, with no room in between for applications, motivation, history, or references to related work. My aim has been to write a set of notes for a very different sort of course.

Vols. for 1923-32 include separately paged sections: "Notes and questions" and "Progress report."

This volume presents in a unified manner both classic as well as modern research results devoted to trigonometric sums. Such sums play an integral role in the formulation and understanding of a broad spectrum of problems which range over surprisingly many and different research areas. Fundamental and new developments are presented to discern solutions to problems across several scientific disciplines. Graduate students and researchers will find within this book numerous examples and a plethora of results related to trigonometric sums through pure and applied research along with open problems and new directions for future research.

This publication was made possible through a bequest from my beloved late wife. by the author which United together in this present collection are those works have not previously appeared in book form. The following are excepted: Vorlesungen fiber Differential und Integralrechnung (Lectures on Differential and Integral Calculus) Vols 1-3, Birkhauser Verlag, Basel (1965-1968); Aufgabensammlung zur Infinitesimalrechnung (Exercises in Infinitesimal Calculus) Vols 1, 2a, 2b, and 3, Birkhauser Verlag, Basel (1967-1977); two issues from Memorial des Sciences on Conformal Mapping (written together with C. Gattegno), Gauthier-Villars, Paris (1949); Solution of Equations in Euclidean and Banach Spaces, Academic Press, New York (1973); and Stu dien fiber den Schottkyschen Satz (Studies on Schottky's Theorem), Wepf & Co., Basel (1931). Where corrections have had to be implemented in the text of certain papers, references to these are made at the conclusion of each paper. In the few instances where this system does not, for technical reasons, seem appropriate, an asterisk in the page margin indicates wherever a correction is necessary and this is then given at the end of the paper. (There is one exception: the correc tions to the paper on page 561 are presented on page 722. The works are published in 6 volumes and are arranged under 16 topic headings. Within each heading, the papers are ordered chronologically according to the date of original publication.

This volume is the hardcopy version of the electronic manuscript, Proceedings of the Organic Mathematics Workshop held at Simon Fraser University in December 1995 (www.cecm.sfu.ca/organics). The book provides a fixed, easily referenced, and permanent version of what is otherwise an evolving document. Contained in this work is a collection of articles on experimental and computational mathematics contributed by leading mathematicians around the world. The papers span a variety of mathematical fields - from juggling to differential equations to prime number theory. The book also contains biographies and photos of the contributing mathematicians and an in-depth characterization of organic mathematics.

Develops the higher parts of function theory in a unified presentation. Starts with elliptic integrals and functions and uniformization theory, continues with automorphic functions and the theory of abelian integrals and ends with the theory of abelian functions and modular functions in several variables. The last topic originates with the author and appears here for the first time in book form.

Ramanujan is recognized as one of the great number theorists of the twentieth century. Here now is the first book to provide an introduction to his work in number theory. Most of Ramanujan's work in number theory arose out of q-series and theta functions. This book provides an introduction to these two important subjects and to some of the topics in number theory that are inextricably intertwined with them, including the theory of partitions, sums of squares and triangular numbers, and the Ramanujan tau function. The majority of the results discussed here are originally due to Ramanujan or were rediscovered by him. Ramanujan did not leave us proofs of the thousands of theorems he recorded in his notebooks, and so it cannot be claimed that many of the proofs given in this book are those found by Ramanujan. However, they are all in the spirit of his mathematics.The subjects examined in this book have a rich history dating back to Euler and Jacobi, and they continue to be focal points of contemporary mathematical research. Therefore, at the end of each of the seven chapters, Berndt discusses the results established in the chapter and places them in both historical and contemporary contexts. The book is suitable for advanced undergraduates and beginning graduate students interested in number theory.

This book is a reissue of classic textbook of mathematical methods.

The aim of these lecture notes is to provide a self-contained exposition of several fascinating formulas discovered by Srinivasa Ramanujan. Two central results in these notes are: (1) the evaluation of the Rogers–Ramanujan continued fraction — a result that convinced G H Hardy that Ramanujan was a “mathematician of the highest class”, and (2) what G. H. Hardy called Ramanujan's “Most Beautiful Identity”. This book covers a range of related results, such as several proofs of the famous Rogers–Ramanujan identities and a detailed account of Ramanujan's congruences. It also covers a range of techniques in q-series. Contents:Jacob's Triple Product IdentityThe Rogers-Ramanujan IdentitiesThe rogers-Ramanujan continued FractionFrom the “Most Beautiful Identity” to Ramanujan's Congruences Readership: Graduate students and researchers in number theory. Keywords:Rogersâ€“Ramanujan Continued Fraction;Rogersâ€“Ramanujan Identities;Ramanujan's â€œMost Beautiful Identityâ€•;Ramanujan CongruencesReviews: “A great strength of this book is that almost every major result is proven in several different ways, illustrating the breadth of approaches to q-series … This book is well written with results that are well motivated and clearly explained. It is an excellent and statisfying introduction to q-series.” Mathematical Reviews

V.1. A.N. v.2. O.Z. Apendices and indexes.

Very roughly speaking, representation theory studies symmetry in linear spaces. It is a beautiful mathematical subject which has many applications, ranging from number theory and combinatorics to geometry, probability theory, quantum mechanics, and quantum field theory. The goal of this book is to give a ``holistic'' introduction to representation theory, presenting it as a unified subject which studies representations of associative algebras and treating the representation theories of groups, Lie algebras, and quivers as special cases. Using this approach, the book covers a number of standard topics in the representation theories of these structures. Theoretical material in the book is supplemented by many problems and exercises which touch upon a lot of additional topics; the more difficult exercises are provided with hints. The book is designed as a textbook for advanced undergraduate and beginning graduate students. It should be accessible to students with a strong background in linear algebra and a basic knowledge of abstract algebra.

In the spring of 1976, George Andrews of Pennsylvania State University visited the library at Trinity College, Cambridge, to examine the papers of the late G.N. Watson. Among these papers, Andrews discovered a sheaf of 138 pages in the handwriting of Srinivasa Ramanujan. This manuscript was soon designated, "Ramanujan's lost notebook." Its discovery has frequently been deemed the mathematical equivalent of finding Beethoven's tenth symphony. This fifth and final installment of the authors’ examination of Ramanujan’s lost notebook focuses on the mock theta functions first introduced in Ramanujan’s famous Last Letter. This volume proves all of the assertions about mock theta functions in the lost notebook and in the Last Letter, particularly the celebrated mock theta conjectures. Other topics feature Ramanujan’s many elegant Euler products and the remaining entries on continued fractions not discussed in the preceding volumes. Review from the second volume:"Fans of Ramanujan's mathematics are sure to be delighted by this book. While some of the content is taken directly from published papers, most chapters contain new material and some previously published proofs have been improved. Many entries are just begging for further study and will undoubtedly be inspiring research for decades to come. The next installment in this series is eagerly awaited."- MathSciNet Review from the first volume:"Andrews and Berndt are to be congratulated on the job they are doing. This is the first step...on the way to an understanding of the work of the genius Ramanujan. It should act as an inspiration to future generations of mathematicians to tackle a job that will never be complete."- Gazette of the Australian Mathematical Society

This monograph is a bridge between the classical theory and modern approach via arithmetic geometry.

This book covers elementary discrete mathematics for computer science and engineering. It emphasizes mathematical definitions and proofs as well as applicable methods. Topics include formal logic notation, proof methods; induction, well-ordering; sets, relations; elementary graph theory; integer congruences; asymptotic notation and growth of functions; permutations and combinations, counting principles; discrete probability. Further selected topics may also be covered, such as recursive definition and structural induction; state machines and invariants; recurrences; generating functions.

Created as a celebration of mathematical pioneer Emma Previato, this comprehensive book highlights the connections between algebraic geometry and integrable systems, differential equations, mathematical physics, and many other areas. The authors, many of whom have been at the forefront of research into these topics for the last decades, have all been influenced by Previato's research, as her collaborators, students, or colleagues. The diverse articles in the book demonstrate the wide scope of Previato's work and the inclusion of several survey and introductory articles makes the text accessible to graduate students and non-experts, as well as researchers. The articles in this second volume discuss areas related to algebraic geometry, emphasizing the connections of this central subject to integrable systems, arithmetic geometry, Riemann surfaces, coding theory and lattice theory.

The aim of this volume is to bring together research ideas from various fields of mathematics which utilize the heat kernel or heat kernel techniques in their research. The intention of this collection of papers is to broaden productive communication across mathematical sub-disciplines and to provide a vehicle which would allow experts in one field to initiate research with individuals in another field, as well as to give non-experts a resource which can facilitate expanding their research and connecting with others.

The series is aimed specifically at publishing peer reviewed reviews and contributions presented at workshops and conferences. Each volume is associated with a particular conference, symposium or workshop. These events cover various topics within pure and applied mathematics and provide up-to-date coverage of new developments, methods and applications.