Elliptic Polylogarithms An Analytic Theory Springer

This book lays the foundations of differential calculus in infinite dimensions and discusses those applications in infinite dimensional differential geometry and global analysis not involving Sobolev completions and fixed point theory. The approach is simple: a mapping is called smooth if it maps smooth curves to smooth curves. Up to Frechet spaces, this notion of smoothness coincides with all known reasonable concepts. In the same spirit, calculus of holomorphic mappings (including Hartogs' theorem and holomorphic uniform boundedness theorems) and calculus of real analytic mappings are developed. Existence of smooth partitions of unity, the foundations of manifold theory in infinite dimensions, the relation between tangent vectors and derivations, and differential forms are discussed thoroughly. Special emphasis is given to the notion of regular infinite dimensional Lie groups. Many applications of this theory are included: manifolds of smooth mappings, groups of diffeomorphisms, geodesics on spaces of Riemannian metrics, direct limit manifolds, perturbation theory of operators, and differentiability questions of infinite dimensional representations.

Motives were introduced in the mid-1960s by Grothendieck to explain the analogies among the various cohomology theories for algebraic varieties, to play the role of the missing rational cohomology, and to provide a blueprint for proving Weil's conjectures about the zeta function of a variety over a finite field. Over the last ten years or so, researchers in various areas--Hodge theory, algebraic K$^*$-theory, polylogarithms, automorphic forms, SL$^*$-functions, $S$-adic representations, trigonometric sums, and algebraic cycles--have discovered that an enlarged (and in part conjectural) theory of "mixed" motives indicates and explains phenomena appearing in each area. Thus the theory holds the potential of enriching and unifying these areas. These two volumes contain the revised texts of nearly all the lectures presented at the AMS-IMS-SIAM Joint Summer Research Conference on Motives, held in Seattle, in 1991.

A number of related works are also included, making for a total of forty-seven papers, from general introductions to specialized surveys to research papers.

This brief hardcover is a classic title covering a renowned series of lectures. A mathematical jewel.

This book features the interplay of two main branches of mathematics: topology and real analysis. The material of the book is largely contained in the research publications of the authors and their students from the past 50 years. Parts of analysis are touched upon in a unique way, for example, Lebesgue measurability, Baire classes of functions, differentiability, $C^n$ and $C^n([0,\infty)$ functions, the Blumberg theorem, bounded variation in the sense of Cesari, and various theorems on Fourier series and generalized bounded variation of a function. Features:

- Contains new results and complete proofs of some known results for the first time.
- Demonstrates the wide applicability of certain basic techniques in measure theory and set-theoretic topology. Gives unified treatments of large bodies of research found in the literature.

This book contains proceedings of the research conference on algebraic K$^*$-theory that took place in Poznan, Poland, in September 1995. The conference concluded the activity of the algebraic K$^*$-theory seminar held at the Adam Mickiewicz University in the academic year 1994-1995. Talks at the conference covered a wide range of current research activities in algebraic K$^*$-theory. In particular, the following topics were covered:

- $K^*$-theory of fields and rings of integers
- $K^*$-theory of elliptic and modular curves
- Theory of motives, motivic cohomology
- Beilinson conjectures
- Algebraic K$^*$-theory of topological spaces
- Topological Hochschild homology and cyclic homology

With contributions by some leading experts in the field, this book provides a look at the state of current research in algebraic K$^*$-theory.

The Wei-Liang Chow and Kuo-Tsai Chen Memorial Conference was proposed and held by Prof S S Chern in Nankai Institute of Mathematics. It was devoted to memorializing those two outstanding and original Chinese mathematicians who had made significant contributions to algebraic geometry and algebraic topology, respectively. It also provided a forum for leading mathematicians to expound and discuss their views on new ideas in these fields, as well as trends in 21st Century mathematics. About 100 mathematicians participated in the conference, including Sir Michael Atiyah, Jacob Palis, Phillip Griffiths, David Eisenbud, Philippe Tondeur, Yujiro Kawamata, Tian Gang, etc. This invaluable volume contains the selected papers presented at the conference. The topics include canonical maps of Gorenstein 3-folds, fundamental groups of algebraic curves, Chen's iterated integrals, algebraic fiber spaces, and 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. Detailed exposition of automorphic representations and their relation to string theory, for mathematicians and theoretical physicists.

This book is the outcome of research initiatives formed during the special "Research Trimester on Multiple Zeta Values, Multiple Polylogarithms, and Quantum Field Theory" at the ICMAT (Instituto de Ciencias Matemáticas, Madrid) in 2014. The activity was aimed at understanding and deepening recent developments where Feynman and string amplitudes on the one hand, and periods and multiple zeta values on the other, have been at the heart of lively and fruitful interactions between theoretical physics and number theory over the past few decades. In this book, the reader will find research papers as well as survey articles, including open problems, on the interface between number theory, quantum field theory and string theory, written by leading experts in the respective fields. Topics include, among others, elliptic periods viewed from both a mathematical and a physical standpoint; further relations between periods and high energy physics, including cluster algebras and renormalisation theory; multiple Eisenstein series and q-analogues of multiple zeta values (also in connection with renormalisation); double shuffle and duality relations; alternative presentations of multiple zeta values using Ecalle's theory of moulds and arborification; a distribution formula for generalised complex and l-adic polylogarithms; Galois action on knots. Given its scope, the book offers a valuable resource for researchers and graduate students interested in topics related to both quantum field theory, in particular, scattering amplitudes, and number theory.

This book is an outgrowth of the Workshop on "Regulators in Analysis, Geom etry and Number Theory" held at the Edmund Landau Center for Research in Mathematical Analysis of The Hebrew University of Jerusalem in 1996. During the preparation and the holding of the workshop we were greatly helped by the director of the Landau Center: Lior Tsafriri during the time of the planning of the conference, and Hershel Farkas during the meeting itself. Organizing and running this workshop was a true pleasure, thanks to the expert technical help provided by the Landau Center in general, and by its secretary Simcha Kojman in particular. We would like to express our hearty thanks to all of them. However, the articles assembled in the present volume do not represent the proceedings of this workshop; neither could all contributors to the book make it to the meeting, nor do the contributions herein necessarily reflect talks given in Jerusalem. In the introduction, we outline our view of the theory to which this volume intends to
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United Kingdom and the United States. During a period of two weeks, 41 invited lectures and 20 contributed lectures were presented. Four lectures by invited speakers were delivered every day, followed by two sessions of contributed talks. Many informal discussions and working sessions involving small groups were organized by individual participants. In addition, participants’ reprints and preprints were displayed through out in a lounge next to the auditorium, which further enhanced opportunities for communication and interaction.

Classically, higher logarithms appear as multivalued functions on the projective line. Today they can be interpreted as entries of the period matrix of a certain variation of Hodge structure, itself called the "polylogarithm". The aim of the book is to document the sheaf-theoretical foundations of the field of polylogarithms. Earlier, partly unpublished results and constructions of Beilinson, Deligne, and Levin on the classical and elliptic polylog are generalized to the context of Shimura varieties. The reader is expected to have a sound background in algebraic geometry. Large parts of the book are expository, and intended as a reference for the working mathematician. Where a self-contained exposition was not possible, the author gives references in order to make the material accessible for advanced graduate students.

This volume contains proceedings of two conferences held in Toronto (Canada) and Kozhikode (India) in 2016 in honor of the 60th birthday of Professor Kumar Murty. The meetings were focused on several aspects of number theory: The theory of automorphic forms and their associated L-functions Arithmetic geometry, with special emphasis on algebraic cycles, Shimura varieties, and explicit methods in the theory of abelian varieties The emerging applications of number theory in information technology Kumar Murty has been a substantial influence in these topics, and the two conferences were aimed at honoring his many contributions to number theory, arithmetic geometry, and information technology.

Serge Lang was an iconic figure in mathematics, both for his own important work and for the indelible impact he left on the field of mathematics, on his students, and on his colleagues. Over the course of his career, Lang traversed a tremendous amount of mathematical ground. As he moved from subject to subject, he found analogies that led to important questions in such areas as number theory, arithmetic geometry, and the theory of negatively curved spaces. Lang's conjectures will keep many mathematicians occupied far into the future. In the spirit of Lang's vast contribution to mathematics, this memorial volume contains articles by prominent mathematicians in a variety of areas of the field, namely Number Theory, Analysis, and Geometry, representing Lang's own breadth of interest and impact. A special introduction by John Tate includes a brief and fascinating account of the Serge Lang's life. This volume's group of 6 editors are also highly prominent mathematicians and were close to Serge Lang, both academically and personally. The volume is suitable to research mathematicians in the areas of Number Theory, Analysis, and Geometry.

This book includes review articles in the field of elliptic integrals, elliptic functions and modular forms intending to foster the discussion between theoretical physicists working on higher loop calculations and mathematicians working in the field of modular forms and functions and analytic solutions of higher order differential and difference equations.

The primary objective of this book is to give a comprehensive exposition of results surrounding the work of the authors concerning boundary regularity of weak solutions of second-order elliptic quasilinear equations in divergence form. The structure of these equations allows coefficients in certain $L^p$ spaces, and thus it is known from classical results that weak solutions are locally Holder continuous in the interior. Here it is shown that weak solutions are continuous at the boundary if and only if a Wiener-type condition is satisfied. This condition reduces to the celebrated Wiener criterion in the case of harmonic functions. The work that accompanies this analysis includes the 'fine' analysis of Sobolev spaces and a development of the associated nonlinear potential theory. The term 'fine' refers to a topology of $\mathcal{R}(\mathbf{R}^n)$ which is induced by the Wiener condition. The book also contains a complete development of regularity of solutions of variational inequalities, including the double obstacle problem, where the obstacles are allowed to be discontinuous. The regularity of the solution is given in terms involving the Wiener-type condition and the fine topology. The case of differential operators with a differentiable structure and $\mathcal{C}^\alpha$ obstacle is also developed. The book concludes with a chapter devoted to the existence theory, thus providing the reader with a complete treatment of the subject ranging from regularity of weak solutions to the existence of weak solutions.

In this text, the authors develop the theory of knotted surfaces in analogy with the classical case of knotted curves in three-dimensional space. Knotted surface diagrams are defined; the theory of Reidemeister moves is developed; and the braid theory of knotted surfaces is characterized.

Celebrating one of the leading figures in contemporary number theory — John H. Coates — on the occasion of his 70th birthday, this collection of contributions covers a range of topics in number theory, concentrating on the arithmetic of elliptic curves, modular forms, and Galois representations. Several of the contributions in this volume were presented at the conference Elliptic Curves, Modular Forms and Iwasawa Theory, held in honour of the 70th birthday of John Coates in Cambridge, March 25-27, 2015. The main unifying theme is Iwasawa theory, a field that John Coates himself has done much to create. This collection is indispensable reading for researchers in Iwasawa theory, and is interesting and valuable for those in many related fields.

This volume contains the proceedings of the conference 'String-Math 2013' which was held June 17-21, 2013 at the Simons Center for Geometry and Physics at Stony Brook University. This was the third in a series of annual meetings devoted to the interface of mathematics and string theory. Topics include the latest developments in supersymmetric and topological field theory, localization techniques, the mathematics of quantum field theory, superstring compactification and duality, scattering amplitudes and their relation to Hodge theory, mirror symmetry and two-dimensional conformal field theory, and many more. This book will be important reading for researchers and students in the area, and for all mathematicians and string theorists who want to update themselves on developments in the math-string interface.

This is the second of two volumes exploring the subject of motives, polylogarithms and Hodge theory. This text includes articles by Carlos Simpson, Donu Arapura, Ludmil Katzarkov, Tony Pantev, Alexander Reznikov, and Constantin Teleman. Both volumes are also available as a set.
This volume presents original research articles and extended surveys related to the mathematical interest and work of Jean-Michel Bismut. His outstanding contributions to probability theory and global analysis on manifolds have had a profound impact on several branches of mathematics in the areas of control theory, mathematical physics and arithmetic geometry. Contributions by: K. Behrend N. Bergeron S. K. Donaldson J. Dubédat B. Duplantier G. Faltings E. Getzler G. Kings R. Mazzeo J. Millson C. Moeglin W. Müller R. Rhodes D. Rössler S. Sheffield A. Teleman G. Tian K-I. Yoshikawa H. Weiss W. Werner

The collection is a valuable resource for graduate students and researchers in these fields. The book focuses on advanced computer algebra methods and special functions that have striking applications in the context of quantum field theory. It presents the state of the art and new methods for (infinite) multiple sums, multiple integrals, in particular Feynman integrals, difference and differential equations in the format of survey articles. The presented techniques emerge from interdisciplinary fields: mathematics, computer science and theoretical physics; the articles are written by mathematicians and physicists with the goal that both groups can learn from the other field, including recent developments. Besides that, the collection of articles also serves as an up-to-date handbook of available algorithms/software that are commonly used or might be useful in the fields of mathematics, physics or other sciences.

Since the first ICM was held in Zürich in 1897, it has become the pinnacle of mathematical gatherings. It aims at giving an overview of the current state of different branches of mathematics and its applications as well as an insight into the treatment of special problems of exceptional importance. The proceedings of the ICMs have provided a rich chronology of mathematical development in all its branches and a unique documentation of contemporary research. They form an indispensable part of every mathematical library. The Proceedings of the International Congress of Mathematicians 1994, held in Zürich from August 3rd to 11th, 1994, are published in two volumes. Volume I contains an account of the organization of the Congress, the list of ordinary members, the reports on the work of the Fields Medalists and the Nevanlinna Prize Winner, the plenary one-hour addresses, and the invited addresses presented at Section Meetings 1 - 6. Volume II contains the invited address for Section Meetings 7 - 19. A complete author index is included in both volumes. ‘A content of these impressive two volumes sheds a certain light on the present state of mathematical sciences and anybody doing research in mathematics should look carefully at these Proceedings. For young people beginning research, this is even more important, so these are a must for any serious mathematics library. The graphical presentation is, as always with Birkhäuser, excellent...’ (Revue Roumaine de Mathematiques pures et Appliquées)

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. From September 13 to 17 in 1999, the First China-Japan Seminar on Number Theory was held in Beijing, China, which was organized by the Institute of Mathematics, Academia Sinica jointly with Department of Mathematics, Peking University. TE:m Japanese Professors and eighteen Chinese Professors attended this seminar. Professor Yuan Wang was the chairman, and Professor Chengbiao Pan was the vice-chairman. This seminar was planned and prepared by Professor Shigeru Kanemitsu and the first-named editor. Talks covered various research fields including analytic number theory, algebraic number theory, modular forms and transcendental number theory. The Great Wall and acrobatics impressed Japanese visitors. From November 29 to December 3 in 1999, an annual conference on analytic number theory was held in Kyoto, Japan, as one of the conferences supported by Research Institute of Mathematical Sciences (RIMS), Kyoto University. The organizer was the second-named editor. About one hundred Japanese scholars and some foreign visitors coming from China, France, Germany and India attended this conference. Talks covered many branches in number theory. The scenery in Kyoto, Arashiyama Mountain and Katsura River impressed foreign visitors. An informal report of this conference was published as the volume 1160 of Surikaiseki Kenkyusho Kokyuroku (June 2000), published by RIMS, Kyoto University. The present book is the Proceedings of these two conferences, which records many some recent progress in number theory in China and Japan and reflects the academic exchanging between China and Japan. This monograph systematically treats a theory of elliptic boundary value problems in domains without singularities and in domains with conical or cuspidal points. This exposition is self-contained and a priori requires only basic knowledge of functional analysis. Restricting to boundary value problems formed by differential operators and avoiding the use of pseudo-differential operators makes the book accessible for a wider readership. The authors concentrate on fundamental results of the theory: estimates for solutions in different function spaces, the Fredholm property of the operator of the boundary value problem, regularity assertions and asymptotic formulas for the solutions near singular points. A special feature of the book is that the solutions of the boundary value problems are considered in Sobolev spaces of both positive and negative orders. Results of the general theory are illustrated by concrete examples. The book may be used for courses in partial differential equations.

Group-theoretic methods have taken an increasingly prominent role in analysis. Some of this change has been due to the writings of Sigurdur Helgason. This book is an introduction to such methods on spaces with symmetry given by the action of a Lie group. The introductory chapter is a self-contained account of the analysis on surfaces of constant curvature. Later chapters cover general cases of the Radon transform, spherical functions, invariant operators, compact symmetric spaces and other topics. This book, together with its companion volume, Geometric Analysis on Symmetric Spaces (AMS Mathematical Surveys and Monographs series, vol. 39, 1994), has become the standard text for this approach to geometric analysis. Sigurdur Helgason was awarded the Steele Prize for outstanding mathematical exposition for Groups and Geometric Analysis and Differential Geometry, Lie Groups and Symmetric Spaces. Volume 1 in this series laid the mathematical foundations of sampling theory; Volume 2 surveys the many applications of the theory both within mathematics and in other areas of science. Topics range over a wide variety of areas, and each application is given a modern treatment. This is the first introductory book on multiple zeta functions and multiple polylogarithms which are the generalizations of the Riemann zeta function and the classical polylogarithms, respectively, to the multiple variable setting. It contains all the basic concepts and the important properties of these functions and their special values. This book is aimed at graduate students, mathematicians and physicists who are interested in this current active area of research. The book will provide a detailed and comprehensive introduction to these objects, their fascinating properties and interesting relations to other mathematical subjects, and various generalizations such as their q-analogs and their finite versions (by taking partial sums modulo suitable prime powers). Historical notes and exercises are provided at the end of each chapter. Contents:Multiple Zeta FunctionsMultiple Polylogarithms (MPLs)Multiple Zeta Values (MZVs)Drinfeld...
Associaator and Single-Valued MZVs
Multiple Zeta Value Identities
Symmetrized Multiple Zeta Values (SMZVs)
Multiple Harmonic Sums (MHSs) and Alternating Version
Finite Multiple Zeta Values and Finite Euler Sums
q-Analogs of Multiple Harmonic (Star) Sums

Readership: Advanced undergraduates and graduate students in mathematics, mathematicians interested in multiple zeta values.

Key Features:
- For the first time, a detailed explanation of the theory of multiple zeta values is given in book form along with numerous illustrations in explicit examples.
- The book provides for the first time a comprehensive introduction to multiple polylogarithms and their special values at roots of unity, from the basic definitions to the more advanced topics in current active research.
- The book contains a few quite intriguing results relating the special values of multiple zeta functions and multiple polylogarithms to other branches of mathematics and physics, such as knot theory and the theory of motives.
- Many exercises contain supplementary materials which deepen the reader’s understanding of the main text.