Riemann S Zeta Function

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Zeta Functions of Groups and Rings Marcus du Sautoy 2008 Thestudyofthesubgroupgrowthofin?nitegroupsisanareaofmathematical research that has grown rapidly since its inception at the Groups St. Andrews conferencein1985.Ithasbecomearichtheoryrequiringtoolsfromandhaving applications to many areas of group theory. Indeed, much of this progress is chronicled by Lubotzky and Segal within their book [42]. However, one area within this study has grown explosively in the last few years. This is the study of the zeta functions of groups with polynomial s- groupgrowth,inparticularfortorsion-free?nitely-generatednilpotentgroups. These zeta functions were introduced in [32], and other key papers in the - velopment of this subject include [10, 17], with [19, 23, 15] as well as [42] presenting surveys of the area. The purpose of this book is to bring into print signi?cant and as yet unpublished work from three areas of the theory of zeta functions of groups. First, there are now numerous calculations of zeta functions of groups by doctoralstudentsofthe?rstauthorwhichareyettobemadeintoprintedform outside their theses. These explicit calculations provide evidence in favour of conjectures, or indeed can form inspiration and evidence for new conjectures. We record these zeta functions in Chap.2. In particular, we document the functional equations frequently satis?ed by the local factors. Explaining this phenomenon is, according to the ?rst author and Segal [23], “one of the most intriguing open problems in the area”.

Spectral Theory of the Riemann Zeta-Function Yoichi Motohashi 1997-09-11 Monograph on most important topic in number theory.

Assigning of values of the prime number counting function to Bernhard Riemann's zeros. Concept of Dirichlet lines in the complex plane William Fidler 2022-02-02 Academic Paper from the year 2022 in the subject Mathematics - Analysis, grade: 2.00, , language: English, abstract: Given their importance as the building blocks of all of the integers, the prime numbers, their number and dispositionwithin the integers have been studied for millennia. In 1859

Bernhard Riemann published a short paper (which only extended to six manuscript pages) concerned with an investigation of the number of prime numbers less than any given number. The outcome of the work revolutionised number theory and in the years following has resulted in almost what could be termed an industry in a particular aspect of his work, now called the Riemann Hypothesis. Riemann showed that all the zero values of the zeta function in the positive part of the complex plane should lie in a region between x = 0 and x = 1, and, in particular, conjectured that they all should lie on the line of symmetry x = 1⁄2. This conjecture, which is the basis of many other conjectures in Number Theory is considered by many mathematicians to be the currently greatest unsolved problem in Mathematics—so much so that the Clay Mathematical Institute of Boston, Mass. has offered one million dollars to anyone who can produce a solution. No attempt is made here to verify the hypothesis, for its validity is not required. A procedure is developed here, by means of which, the zeros of Riemann's zeta function in the so-called Critical Strip of the complex plane may be assigned values of the prime number counting function. The procedure is novel and uses the concept of a Dirichlet line in the complex plane and a quantity called a nearodd (both of which are defined in the text). The process may be rendered self-contained, in the sense that, when it is associated with Gram's series the only input required is the magnitude of the imaginary part of the function s = x + iy which will locate a Riemann zero on the Critical Line; vast numbers of zeros may be accessed in [2]. Further, it is shown that the Riemann conjecture is irrelevant in the assigning of any particular value of the prime number counting function to the corresponding Riemann zero. It is suggested, pace Wiles, who obtained a proof of Fermat's Last Theorem as a by-product of his verification of the Taniyama-Shimura conjecture, that, in the light of Godel's incompleteness theorems, Riemann's hypothesis may be undecidable.

Riemann's Zeta Function Harold M. Edwards 2001-01-01 Superb high-level study of one of the most influential classics in mathematics examines landmark 1859 publication entitled “On the Number of Primes Less Than a Given Magnitude,” and traces developments in theory inspired by it. Topics include Riemann's main formula, the prime number theorem, the Riemann-Siegel formula, large-scale computations, Fourier analysis, and other related topics. English translation of Riemann's original document appears in the Appendix.

The Riemann Zeta-Function Aleksandar Ivic 2012-07-12 This text covers exponential integrals and sums, 4th power moment, zero-free region, mean value estimates over short intervals, higher power moments, omega results, zeros on the critical line, zero-density estimates, and more. 1985 edition.

Prime Numbers and the Riemann Hypothesis Barry Mazur 2016-04-11 This book introduces prime numbers and explains the famous unsolved Riemann hypothesis.

In Pursuit of Zeta-3 Paul J. Nahin 2021-10-19 "For centuries, mathematicians have tried, and failed, to solve the zeta-3 problem. This problem is simple in its formulation, but remains unsolved to this day, despite the attempts of some of the world's greatest mathematicians to solve it. The problem can be stated as follows: is there a simple symbolic formula for the following sum: 1+(1/2)^3+(1/3)^3+(1/4)^3+...? Although it is possible to calculate the approximate numerical value of the sum (for those interested, it's 1.20205...), there is no known symbolic expression. A symbolic formula would not only provide an exact value for the sum, but would allow for greater insight into its characteristics and properties. The answers to these questions are not of purely academic interest; the zeta-3 problem has close connections to physics, engineering, and other areas of mathematics. Zeta-3 arises in quantum electrodynamics and in number theory, for instance, and it is closely connected to the Riemann hypothesis. In In Pursuit of zeta-3, Paul Nahin turns his sharp, witty eye on the zeta-3 problem. He describes the problem's history, and provides numerous "challenge questions" to engage readers, along with Matlab code. Unlike other, similarly challenging problems, anyone with a basic mathematical background can understand the problem-making it an ideal choice for a pop math book"--

In Search of the Riemann Zeros Michel Laurent Lapidus 2008 Formulated in 1859, the Riemann Hypothesis is the most celebrated and multifaceted open problem in mathematics. In essence, it states that the primes are distributed as harmoniously as possible--or, equivalently, that the Riemann zeros are located on a single vertical line, called the critical line.

The Riemann Hypothesis and the Roots of the Riemann Zeta Function Samuel W. Gilbert 2009 The author demonstrates that the Dirichlet series representation of the Riemann zeta function converges geometrically at the roots in the critical strip. The Dirichlet series parts of the Riemann zeta function diverge everywhere in the critical strip. It has therefore been assumed for at least 150 years that the Dirichlet series representation of the zeta function is useless for characterization of the non-trivial roots. The author shows that this assumption is completely wrong. Reduced, or simplified, asymptotic expansions for the terms of the zeta function series parts are equated algebraically with reduced asymptotic expansions for the terms of the zeta function series parts with reflected argument, constraining the real parts of the roots of both functions to the critical line. Hence, the Riemann hypothesis is correct. Formulae are derived and solved numerically, yielding highly accurate values of the imaginary parts of the roots of the zeta function.

The Theory of Functions Edward Charles Titchmarsh 2002

Dr. Riemann's Zeros Karl Sabbagh 2003 In 1859 Bernhard Riemann, a shy German mathematician, gave an answer to a problem that had long puzzled mathematicians. Although he couldn't provide a proof, Riemann declared that his solution was 'very probably' true. For the next one hundred and fifty years, the world's mathematicians have longed to confirm the Riemann hypothesis. So great is the interest in its solution that in 2001, an American foundation offered a million-dollar prize to the first person to demonstrate that the hypothesis is correct. In this book, Karl Sabbagh makes accessible even the airiest peaks of maths and paints vivid portraits of the people racing to solve the problem. Dr. Riemann's Zeros is a gripping exploration of the mystery at the heart of our counting system.

Zeta and Q-Zeta Functions and Associated Series and Integrals H. M. Srivastava 2011-10-25 Zeta and q-Zeta Functions and Associated Series and Integrals is a thoroughly revised, enlarged and updated version of Series Associated with the Zeta and Related Functions. Many of the chapters and sections of the book have been significantly modified or rewritten, and a new chapter on the theory and applications of the basic (or q-) extensions of various special functions is included. This book will be invaluable because it covers not only detailed and systematic presentations of the theory and applications of the various methods and techniques used in dealing with many different classes of series and integrals associated with the Zeta and related functions, but stimulating historical accounts of a large number of problems and well-classified tables of series and integrals. Detailed and systematic presentations of the theory and applications of the various methods and techniques used in dealing with many different classes of series and integrals associated with the Zeta and related functions

Euler L-Function and the Riemann Hypothesis Jason Cole 2016-12-29 I discovered a L-function hidden in Euler's Product formula that is the breakthrough in proving Riemann Hypothesis. The cover page of this book is a graph of Euler L function and the equation you also see on the cover page is the L-function form of Euler Product formula. I call it the Euler L function. The Euler Product formula is unique in that it describes the Riemann Zeta function in terms of a product over the Prime Numbers and it equals the Riemann Zeta function. One of the long standing mysteries of mathematics is the Riemann Hypothesis associated with the Riemann Zeta function. It is deeply related to Prime Numbers. No one has had a clue on how to prove the Riemann Hypothesis and has stood as a 157 problem that remained unproven. Proving it has been so important that 1 million prize award is waiting for whoever proves the Riemann Hypothesis. What I discovered equates to a mathematical buried treasure. Hidden in Euler Product formula is a L-function of the Product over the primes that can be computed and graphed(see cover page) to prove Riemann Hypothesis that all nontrivial zeros of the Zeta function have a real part 1/2.

Exploring the Riemann Zeta Function Hugh Montgomery 2017-09-11 Exploring the Riemann Zeta Function: 190 years from Riemann's Birth presents a collection of chapters contributed by eminent experts devoted to the Riemann Zeta Function, its generalizations, and their various applications to several scientific disciplines, including Analytic Number Theory, Harmonic Analysis, Complex Analysis, Probability Theory, and related subjects. The book focuses on both old and new results towards the solution of long-standing problems as well as it features some key historical remarks. The purpose of this volume is to present in a unified way broad and deep areas of research in a self-contained manner. It will be particularly useful for graduate courses and seminars as well as it will make an excellent reference tool for graduate students and researchers in Mathematics, Mathematical Physics, Engineering and Cryptography.

Series Associated With the Zeta and Related Functions Hari M. Srivastava 2001 Designed as a reference work and also as a graduate-level textbook, this volume presents an up-to-date and comprehensive account of the theories and applications of the various methods and techniques used in dealing with problems involving closed-form evaluations of (and representations of the Riemann Zeta function at positive integer arguments as) numerous families of series associated with the Riemann Zeta function, the Hurwitz Zeta function, and their extensions and generalizations such as Lerch's transcendent (or the Hurwitz-Lerch Zeta function). Audience: This book is intended for professional mathematicians and graduate students in mathematical sciences (both pure and applied).

On the Asymptotics to all Orders of the Riemann Zeta Function and of a Two-Parameter Generalization of the Riemann Zeta Function Athanassios S. Fokas 2022-02-02 View the abstract.

The verification of a Riemann Hypothesis in the negative half of the complex plane William Fidler 2022-08-19 Akademische Arbeit aus dem Fachbereich Mathematik - Analysis, Note: 2.00, , Sprache: Deutsch, Abstract: In this paper, a new zeta function is derived. The function is a novel form of a Riemann zeta function. Whilst all the exponents of the terms in the denominators in the series are complex numbers, the function can be shown to be real, zero or complex at any locations of interest in the complex plane. In particular, if regions having the dimensions of Riemann's Critical Strip are formed, where the line of symmetry passes through a trivial zero of Riemann's zeta function, it is shown that zeros values of this new function will only be found along these lines of symmetry, and, indeed, nowhere else in the negative half of the complex plane. It is then considered that this constitutes verification of a Riemann Hypothesis for this function in these regions.

The Riemann Hypothesis and the Distribution of Prime Numbers Naji Arwashan 2021 "This book is an introductory and comprehensive presentation of the Riemann Hypothesis, one of the most important open questions in math today. It is introductory because it is written in an accessible and detailed format that makes it easy to read and understand. And it is comprehensive because it explains and proves all the mathematical ideas surrounding and leading to the formulation of the hypothesis. Chapter 1 begins by defining the zeta function and exploring some of its properties when the argument is a real number. It proceeds to identify the series' domain of convergence and proves Euler's product formula. Chapter 2 introduces complex numbers and the complex analytic tools necessary to understand the zeta function in complex plane. Chapter 3 extends the domain of the zeta function for the first time by introducing the eta function. Presenting proofs by Sondow, it is shown that zeta can be defined for any complex number whose real part is positive. Next, the functional equation of the zeta function is derived in Chapter 4. This provides a method to extend the definition of zeta to the entirety of the complex plane. Chapter

5 is where the Riemann Hypothesis is properly introduced for the first time. It relates the zeros of the zeta and eta functions which leads to a simple formulation of the hypothesis. Chapters 6 and 7 connect the topics of zeta's zeros and the distribution of prime numbers. Chapter 6 introduces Riemann explicit formula and explains the use of Mobius transform to rewrite the prime counting function in terms of the Riemann prime counting one and it provides a detailed numerical example on how to use the Riemann's formula. Chapter 7 derives the von Mangoldt formula via the residue theorem and elucidates some of its important properties. Certain necessary mathematical tools, such as Fourier analysis and theta and gamma functional equations, are included in the appendices to make the chapters more concise and focused"--

The Riemann Hypothesis Peter B. Borwein 2008 The Riemann Hypothesis has become the Holy Grail of mathematics in the century and a half since 1859 when Bernhard Riemann, one of the extraordinary mathematical talents of the 19th century, originally posed the problem. While the problem is notoriously difficult, and complicated even to state carefully, it can be loosely formulated as "the number of integers with an even number of prime factors is the same as the number of integers with an odd number of prime factors." The Hypothesis makes a very precise connection between two seemingly unrelated mathematical objects, namely prime numbers and the zeros of analytic functions. If solved, it would give us profound insight into number theory and, in particular, the nature of prime numbers. This book is an introduction to the theory surrounding the Riemann Hypothesis. Part I serves as a compendium of known results and as a primer for the material presented in the 20 original papers contained in Part II. The original papers place the material into historical context and illustrate the motivations for research on and around the Riemann Hypothesis. Several of these papers focus on computation of the zeta function, while others give proofs of the Prime Number Theorem, since the Prime Number Theorem is so closely connected to the Riemann Hypothesis. The text is suitable for a graduate course or seminar or simply as a reference for anyone interested in this extraordinary conjecture.

Bernoulli Numbers and Zeta Functions Tsuneo Arakawa 2014-07-16 Two major subjects are treated in this book. The main one is the theory of Bernoulli numbers and the other is the theory of zeta functions. Historically, Bernoulli numbers were introduced to give formulas for the sums of powers of consecutive integers. The real reason that they are indispensable for number theory, however, lies in the fact that special values of the Riemann zeta function can be written by using Bernoulli numbers. This leads to more advanced topics, a number of which are treated in this book: Historical remarks on Bernoulli numbers and the formula for the sum of powers of consecutive integers; a formula for Bernoulli numbers by Stirling numbers; the Clausen–von Staudt theorem on the denominators of Bernoulli numbers; Kummer's congruence between Bernoulli numbers and a related theory of p-adic measures; the Euler–Maclaurin summation formula; the functional equation of the Riemann zeta function and the Dirichlet L functions, and their special values at suitable integers; various formulas of exponential sums expressed by generalized Bernoulli numbers; the relation between ideal classes of orders of quadratic fields and equivalence classes of binary quadratic forms; class number formula for positive definite binary quadratic forms; congruences between some class numbers and Bernoulli numbers; simple zeta functions of prehomogeneous vector spaces; Hurwitz numbers; Barnes multiple zeta functions and their special values; the functional equation of the double zeta functions; and poly-Bernoulli numbers. An appendix by Don Zagier on curious and exotic identities for Bernoulli numbers is also supplied. This book will be enjoyable both for amateurs and for professional researchers. Because the logical relations between the chapters are loosely connected, readers can start with any chapter depending on their interests. The expositions of the topics are not always typical, and some parts are completely new.

An Introduction to the Theory of the Riemann Zeta-Function S. J. Patterson 1995-02-02 An introduction to the analytic techniques used in the investigation of zeta functions through the example of the Riemann zeta function. It emphasizes central ideas of broad application, avoiding technical results and the customary function-theoretic appro

Lectures on Mean Values of the Riemann Zeta Function A. Ivić 1991 This is an advanced text on the Riemann zeta-function, a continuation of theauthor's earlier book. It presents the most recent results on mean values, many of which had not yet appeared in print at the time of the writing of the text. An especially detailed discussion is given of the second and the fourth moment, and the latter is studied by the use of spectral theory, one of the most powerful methods used lately in analytic number theory. The book presupposes a reasonable knowledge of zeta-function theory and complex analysis. It will be of great use to the researchers in the field, an to all those who wish to get well acquainted with the subject or who have the need for application of zeta-function theory.

Number Theory Helmut Koch 2000 Number theory is one of the largest and most popular subject areas in mathematics, and this book is a superb entry to the subject. It features a well-known international author and covers enough material to satisfy both students and the serious researcher. A splendid addition to the marque series of the AMS publishing program.

Spectral Theory of the Riemann Zeta-Function Yoichi Motohashi 1997-09-11 The Riemann zeta function is one of the most studied objects in mathematics, and is of fundamental importance. In this book, based on his own research, Professor Motohashi shows that the function is closely bound with automorphic forms and that many results from there can be woven with techniques and ideas from analytic number theory to yield new insights into, and views of, the zeta function itself. The story starts with an elementary but unabridged treatment of the spectral resolution of the non-Euclidean Laplacian and the trace formulas. This is achieved by the use of standard tools from analysis rather than any heavy machinery, forging a substantial aid for beginners in spectral theory as well. These ideas are then utilized to unveil an image of the zeta-function, first perceived by the author, revealing it to be the main gem of a necklace composed of all automorphic L-functions. In this book, readers will find a detailed account of one of the most fascinating stories in the development of number theory, namely the fusion of two main fields in mathematics that were previously studied separately.

On zeros of Riemann's zeta function in the negative half of the complex plane. Dirichlet lines and the concept of Riemann lines William Fidler 2022-06-22 Academic Paper from the year 2022 in the subject Mathematics - Analysis, grade: 2.0, , language: English, abstract: The concept of a Dirichlet line in the complex plane was developed in [1]. This analysis is here extended to define another line in the complex plane, called by the author, a Riemann line. These lines are shown to extend throughout the whole of the complex plane. Along Dirichlet lines the zeta function is given by the negative of Dirichlet's alternating function for a real number, whilst along a Riemann line the zeta function is given by the zeta function for a real number. It is shown that there are an infinite number of these lines in the complex plane and, at the intersection of which with an ordinate line passing through any of the trivial zeros of the Riemann zeta function a zero of a Riemann zeta function is located. A distinguishing characteristic of the Dirichlet lines and the Riemann lines is that they are associated with a multiplier which is an odd number for a Dirichlet line and an evev number for a Riemann line.

The Bloch-Kato Conjecture for the Riemann Zeta Function John Coates 2015-03-13 A graduate-level account of an important recent result concerning the Riemann zeta function.

The Lerch zeta-function Antanas Laurincikas 2013-12-11 The Lerch zeta-function is the first monograph on this topic, which is a generalization of the classic Riemann, and Hurwitz zeta-functions. Although analytic results have been presented previously in various monographs on zeta-functions, this is the first book containing both analytic and probability theory of Lerch zeta-functions. The book starts with classical analytical theory (Euler gamma-functions, functional equation, mean square). The majority of the presented results are new: on approximate functional equations and its applications and on zero distribution (zero-free regions, number of nontrivial zeros etc). Special attention is given to limit theorems in the sense of the weak convergence of probability measures for the Lerch zeta-function. From limit theorems in the space of analytic functions the universitality and functional independence is derived. In this respect the book continues the research of the first author presented in the monograph Limit Theorems for the Riemann zeta-function. This book will be useful to researchers and graduate students working in analytic and probabilistic number theory, and can also be used as a textbook for postgraduate students.

The Zeta Function Of Riemann E C Titchmarsh 2021-09-09 This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it. This work is in the public domain in the

United States of America, and possibly other nations. Within the United States, you may freely copy and distribute this work, as no entity (individual or corporate) has a copyright on the body of the work. Scholars believe, and we concur, that this work is important enough to be preserved, reproduced, and made generally available to the public. To ensure a quality reading experience, this work has been proofread and republished using a format that seamlessly blends the original graphical elements with text in an easy-to-read typeface. We appreciate your support of the preservation process, and thank you for being an important part of keeping this knowledge alive and relevant.

Riemann Zeta Function Computed As Z(0. 5+yi+zi): 3D Riemann Hypothesis Jason Cole 2017-11-23 In this book, I investigate (on a undergraduate level) the implication of 3D nontrivial zero solutions and its connection to the Montgomery Pair correlation conjecture. If their exist a 3D landscape to the nontrivial zeros (3D Riemann Hypothesis) then correspondingly their exist a 3D eigenvalue landscape. The arrangement of these 3D hypercomplex eigenvalue equivalent to 3D hypercomplex nontrivial zero solutions. What makes this so interesting is that this 3D eigenvalue landscape may be describing a new undiscovered 3D hypercomplex Quantum Mechanical landscape. I also explore other new discoveries on L-functions and the Prime Number Theorem.

Complex Analysis in Number Theory Anatoly A. Karatsuba 1994-11-22 This book examines the application of complex analysis methods to the theory of prime numbers. In an easy to understand manner, a connection is established between arithmetic problems and those of zero distribution for special functions. Main achievements in this field of mathematics are described. Indicated is a connection between the famous Riemann zeta-function and the structure of the universe, information theory, and quantum mechanics. The theory of Riemann zeta-function and, specifically, distribution of its zeros are presented in a concise and comprehensive way. The full proofs of some modern theorems are given. Significant methods of the analysis are also demonstrated as applied to fundamental problems of number theory.

Quantized Number Theory, Fractal Strings And The Riemann Hypothesis: From Spectral Operators To Phase Transitions And Universality Hafedh Herichi 2021-07-27 Studying the relationship between the geometry, arithmetic and spectra of fractals has been a subject of significant interest in contemporary mathematics. This book contributes to the literature on the subject in several different and new ways. In particular, the authors provide a rigorous and detailed study of the spectral operator, a map that sends the geometry of fractal strings onto their spectrum. To that effect, they use and develop methods from fractal geometry, functional analysis, complex analysis, operator theory, partial differential equations, analytic number theory and mathematical physics.Originally, M L Lapidus and M van Frankenhuijsen 'heuristically' introduced the spectral operator in their development of the theory of fractal strings and their complex dimensions, specifically in their reinterpretation of the earlier work of M L Lapidus and H Maier on inverse spectral problems for fractal strings and the Riemann hypothesis.One of the main themes of the book is to provide a rigorous framework within which the corresponding question 'Can one hear the shape of a fractal string?' or, equivalently, 'Can one obtain information about the geometry of a fractal string, given its spectrum?' can be further reformulated in terms of the invertibility or the quasi-invertibility of the spectral operator.The infinitesimal shift of the real line is first precisely defined as a differentiation operator on a family of suitably weighted Hilbert spaces of functions on the real line and indexed by a dimensional parameter c. Then, the spectral operator is defined via the functional calculus as a function of the infinitesimal shift. In this manner, it is viewed as a natural 'quantum' analog of the Riemann zeta function. More precisely, within this framework, the spectral operator is defined as the composite map of the Riemann zeta function with the infinitesimal shift, viewed as an unbounded normal operator acting on the above Hilbert space.It is shown that the quasi-invertibility of the spectral operator is intimately connected to the existence of critical zeros of the Riemann zeta function, leading to a new spectral and operator-theoretic reformulation of the Riemann hypothesis. Accordingly, the spectral operator is quasi-invertible for all values of the dimensional parameter c in the critical interval (0,1) (other than in the midfractal case when c =1/2) if and only if the Riemann hypothesis (RH) is true. A related, but seemingly quite different, reformulation of RH, due to the second author and referred to as an 'asymmetric criterion for RH', is also discussed in some detail: namely, the spectral operator is invertible for all values of c in the left-critical interval (0,1/2) if and only if RH is true.These spectral reformulations of RH also led to the discovery of several 'mathematical phase transitions' in this context, for the shape of the spectrum, the invertibility, the boundedness or the unboundedness of the spectral operator, and occurring either in the midfractal case or in the most fractal case when the underlying fractal dimension is equal to ½ or 1, respectively. In particular, the midfractal dimension c=1/2 is playing the role of a critical parameter in quantum statistical physics and the theory of phase transitions and critical phenomena.Furthermore, the authors provide a 'quantum analog' of Voronin's classical theorem about the universality of the Riemann zeta function. Moreover, they obtain and study quantized counterparts of the Dirichlet series and of the Euler product for the Riemann zeta function, which are shown to converge (in a suitable sense) even inside the critical strip.For pedagogical reasons, most of the book is devoted to the study of the quantized Riemann zeta function. However, the results obtained in this monograph are expected to lead to a quantization of most classic arithmetic zeta functions, hence, further 'naturally quantizing' various aspects of analytic number theory and arithmetic geometry.The book should be accessible to experts and non-experts alike, including mathematics and physics graduate students and postdoctoral researchers, interested in fractal geometry, number theory, operator theory and functional analysis, differential equations, complex analysis, spectral theory, as well as mathematical and theoretical physics. Whenever necessary, suitable background about the different subjects involved is provided and the new work is placed in its proper historical context. Several appendices supplementing the main text are also included.

On the Size of the Riemann Zeta-function at Places Symmetric with Respect to the Point 1/2 R. D. Dixon 1964 Improvement is made on and a simpler proof provided of a result of R. Spira which is to appear in the Duke Mathematical Journal. This result is that if s = sigma + it and zeta is the Riemann zeta-function, then absolute value (zeta (1 - s))> absolute value (zeta (s)) for all s other than zeros of zeta provided t>or = 6.8 and sigma 1/2. The proof uses Stirling's formula, as did Spira's.

Prime Obsession John Derbyshire 2003-04-15 In August 1859 Bernhard Riemann, a little-known 32-year old mathematician, presented a paper to the Berlin Academy titled: "On the Number of Prime Numbers Less Than a Given Quantity." In the middle of that paper, Riemann made an incidental remark â€" a guess, a hypothesis. What he tossed out to the assembled mathematicians that day has proven to be almost cruelly compelling to countless scholars in the ensuing years. Today, after 150 years of careful research and exhaustive study, the question remains. Is the hypothesis true or false? Riemann's basic inquiry, the primary topic of his paper, concerned a straightforward but nevertheless important matter of arithmetic â€" defining a precise formula to track and identify the occurrence of prime numbers. But it is that incidental remark â€" the Riemann Hypothesis â€" that is the truly astonishing legacy of his 1859 paper. Because Riemann was able to see beyond the pattern of the primes to discern traces of something mysterious and mathematically elegant shrouded in the shadows â€" subtle variations in the distribution of those prime numbers. Brilliant for its clarity, astounding for its potential consequences, the Hypothesis took on enormous importance in mathematics. Indeed, the successful solution to this puzzle would herald a revolution in prime number theory. Proving or disproving it became the greatest challenge of the age. It has become clear that the Riemann Hypothesis, whose resolution seems to hang tantalizingly just beyond our grasp, holds the key to a variety of scientific and mathematical investigations. The making and breaking of modern codes, which depend on the properties of the prime numbers, have roots in the Hypothesis. In a series of extraordinary developments during the 1970s, it emerged that even the physics of the atomic nucleus is connected in ways not yet fully understood to this strange conundrum. Hunting down the solution to the Riemann Hypothesis has become an obsession for many â€" the veritable "great white whale" of mathematical research. Yet despite determined efforts by generations of mathematicians, the Riemann Hypothesis defies resolution. Alternating passages of extraordinarily lucid mathematical exposition with chapters of elegantly composed biography and history, Prime Obsession is a fascinating and fluent account of an epic mathematical mystery that continues to challenge and excite the world. Posited a century and a half ago, the Riemann Hypothesis is an intellectual feast for the cognoscenti and the curious alike. Not just a story of numbers and calculations, Prime Obsession is the engrossing tale of a relentless hunt for an elusive proof â€" and those who have been consumed by it.

Automorphic Forms on GL (2) H. Jacquet 2006-11-15

The Theory of the Riemann Zeta-function Late Savilian Professor of Geometry E C Titchmarsh 1986 The Riemann zeta-function embodies both additive and multiplicative structures in a single function, making it our most important tool in the study of prime numbers. This volume studies all aspects of the theory, starting from first principles and probing the function's own challenging theory, with the famous and still unsolved "Riemann hypothesis" at its heart. The second edition has been revised to include descriptions of work done in the last forty years and is updated with many additional references; it will provide stimulating reading for postgraduates and workers in analytic number theory and classical analysis.

Zeta Functions of Graphs Audrey Terras 2010-11-18 Graph theory meets number theory in this stimulating book. Ihara zeta functions of finite graphs are reciprocals of polynomials, sometimes in several variables. Analogies abound with number-theoretic functions such as Riemann/Dedekind zeta functions. For example, there is a Riemann hypothesis (which may be false) and prime number theorem for graphs. Explicit constructions of graph coverings use Galois theory to generalize Cayley and Schreier graphs. Then non-isomorphic simple graphs with the same zeta are produced, showing you cannot hear the shape of a graph. The spectra of matrices such as the adjacency and edge adjacency matrices of a graph are essential to the plot of this book, which makes connections with quantum chaos and random matrix theory, plus expander/Ramanujan graphs of interest in computer science. Created for beginning graduate students, the book will also appeal to researchers. Many well-chosen illustrations and exercises, both theoretical and computer-based, are included throughout.

Lectures on the Riemann Zeta Function H. Iwaniec 2014-10-07 The Riemann zeta function was introduced by L. Euler (1737) in connection with questions about the distribution of prime numbers. Later, B. Riemann (1859) derived deeper results about the prime numbers by considering the zeta function in the complex variable. The famous Riemann Hypothesis, asserting that all of the non-trivial zeros of zeta are on a critical line in the complex plane, is one of the most important unsolved problems in modern mathematics. The present book consists of two parts. The first part covers classical material about the zeros of the Riemann zeta function with applications to the distribution of prime numbers, including those made by Riemann himself, F. Carlson, and Hardy-Littlewood. The second part gives a complete presentation of Levinson's method for zeros on the critical line, which allows one to prove, in particular, that more than one-third of non-trivial zeros of zeta are on the critical line. This approach and some results concerning integrals of Dirichlet polynomials are new. There are also technical lemmas which can be useful in a broader context.

On the Riemann Hypothesis William Fidler 2021-04-15 Academic Paper from the year 2021 in the subject Mathematics - Analysis, grade: 2.00, , language: English, abstract: It is demonstrated in this work that we may construct an infinite number of strips in the complex plane having the same 'dimensions as the Critical Strip and which are devoid of Riemann zeros except on the line of symmetry. It is shown that the number of zeros on each line is infinite, indeed, there is a Riemann zero at infinity. It is posited that a form of the Riemann conjecture is verified in each strip. It is shown that each integer in the infinite set of the integers has an associated Riemann zero and that the imaginary parts of the complex number at which the zeros are located are proportional to the 'local' asymptote to the prime counting function. A connection between the prime counting function and the zeta function is established. A limited distribution of the Riemann zeros corresponding to their respective prime numbers is constructed and it is seen that, at least over this range, the two are correlated, albeit non-linearly. It is demonstrated that the imaginary part of the complex number locating a Riemann zero may, for any integer that can be articulated, be obtained by a few keystrokes of a hand calculator.

Limit Theorems for the Riemann Zeta-Function Antanas Laurincikas 2013-03-09 The subject of this book is probabilistic number theory. In a wide sense probabilistic number theory is part of the analytic number theory, where the methods and ideas of probability theory are used to study the distribution of values of arithmetic objects. This is usually complicated, as it is difficult to say anything about their concrete values. This is why the following problem is usually investigated: given some set, how often do values of an arithmetic object get into this set? It turns out that this frequency follows strict mathematical laws. Here we discover an analogy with quantum mechanics where it is impossible to describe the chaotic behaviour of one particle, but that large numbers of particles obey statistical laws. The objects of investigation of this book are Dirichlet series, and, as the title shows, the main attention is devoted to the Riemann zeta-function. In studying the distribution of values of Dirichlet series the weak convergence of probability measures on different spaces (one of the principle asymptotic probability theory methods) is used. The application of this method was launched by H. Bohr in the third decade of this century and it was implemented in his works together with B. Jessen. Further development of this idea was made in the papers of B. Jessen and A. Wintner, V. Borchsenius and B.

The Riemann Zeta-Function Anatoly A. Karatsuba 1992-01-01 The aim of the series is to present new and important developments in pure and applied mathematics. Well established in the community over two decades, it offers a large library of mathematics including several important classics. The volumes supply thorough and detailed expositions of the methods and ideas essential to the topics in question. In addition, they convey their relationships to other parts of mathematics. The series is addressed to advanced readers wishing to thoroughly study the topic. Editorial Board Lev Birbrair, Universidade Federal do Ceará, Fortaleza, Brasil Victor P. Maslov, Russian Academy of Sciences, Moscow, Russia Walter D. Neumann, Columbia University, New York, USA Markus J. Pflaum, University of Colorado, Boulder, USA Dierk Schleicher, Jacobs University, Bremen, Germany