Graduate Texts in Mathematics

Serge Lang

Cyclotomic Fields II

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Cyclotomic Fields

Lawrence C Washington

Cyclotomic Fields:

Introduction to Cyclotomic Fields Lawrence C. Washington,2012-12-06 Introduction to Cyclotomic Fields is a carefully written exposition of a central area of number theory that can be used as a second course in algebraic number theory Starting at an elementary level the volume covers p adic L functions class numbers cyclotomic units Fermat s Last Theorem and Iwasawa s theory of Z_p extensions leading the reader to an understanding of modern research literature Many exercises are included The second edition includes a new chapter on the work of Thaine Kolyvagin and Rubin including a proof of the Main Conjecture There is also a chapter giving other recent developments including primality testing via Jacobi sums and Sinnott s proof of the vanishing of Iwasawa s f invariant **Cyclotomic Fields** S. Lang,2012-12-06 Kummer s work on cyclotomic fields paved the way for the development of algebraic number theory in general by Dedekind Weber Hensel Hilbert Takagi Artin and others However the success of this general theory has tended to obscure special facts proved by Kummer about cyclotomic fields which lie deeper than the general theory For a long period in the 20th century this aspect of Kummer s work seems to have been largely forgotten except for a few papers among which are those by Pollaczek Po Artin Hasse A H and Vandiver Va In the mid 1950 s the theory of cyclotomic fields was taken up again by Iwasawa and Leopoldt Iwasawa viewed cyclotomic fields as being analogues for number fields of the constant field extensions of algebraic geometry and wrote a great sequence of papers investigating towers of cyclotomic fields and more generally Galois extensions of number fields whose Galois group is isomorphic to the additive group of p adic integers Leopoldt concentrated on a fixed cyclotomic field and established various p adic analogues of the classical complex analytic class number formulas In particular this led him to introduce with Kubota p adic analogues of the complex L functions attached to cyclotomic extensions of the rationals Finally in the late 1960 s Iwasawa Iw 1 I made the fundamental discovery that there was a close connection between his work on towers of cyclotomic fields and these p adic L functions of Leopoldt Kubota

Cyclotomic Fields I and II Serge Lang,2012-12-06 Kummer s work on cyclotomic fields paved the way for the development of algebraic number theory in general by Dedekind Weber Hensel Hilbert Takagi Artin and others However the success of this general theory has tended to obscure special facts proved by Kummer about cyclotomic fields which lie deeper than the general theory For a long period in the 20th century this aspect of Kummer s work seems to have been largely forgotten except for a few papers among which are those by Pollaczek Po Artin Hasse A H and Vandiver Va In the mid 1950 s the theory of cyclotomic fields was taken up again by Iwasawa and Leopoldt Iwasawa viewed cyclotomic fields as being analogues for number fields of the constant field extensions of algebraic geometry and wrote a great sequence of papers investigating towers of cyclotomic fields and more generally Galois extensions of number fields whose Galois group is isomorphic to the additive group of p adic integers Leopoldt concentrated on a fixed cyclotomic field and established various p adic analogues of the classical complex analytic class number formulas In particular this led him to introduce with Kubota p

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Cyclotomic Fields S. Lang,1978-08-08 Kummer s work on cyclotomic fields paved the way for the development of algebraic number theory in general by Dedekind Weber Hensel Hilbert Takagi Artin and others However the success of this general theory has tended to obscure special facts proved by Kummer about cyclotomic fields which lie deeper than the general theory For a long period in the 20th century this aspect of Kummer s work seems to have been largely forgotten except for a few papers among which are those by Pollaczek Po Artin Hasse A H and Vandiver Va In the mid 1950 s the theory of cyclotomic fields was taken up again by Iwasawa and Leopoldt Iwasawa viewed cyclotomic fields as being analogues for number fields of the constant field extensions of algebraic geometry and wrote a great sequence of papers investigating towers of cyclotomic fields and more generally Galois extensions of number fields whose Galois group is isomorphic to the additive group of p adic integers Leopoldt concentrated on a fixed cyclotomic field and established various p adic analogues of the classical complex analytic class number formulas In particular this led him to introduce with Kubota p adic analogues of the complex L functions attached to cyclotomic extensions of the rationals Finally in the late 1960 s Iwasawa Iw 1 I made the fundamental discovery that there was a close connection between his work on towers of cyclotomic fields and these p adic L functions of Leopoldt Kubota **The Theory of Algebraic Number Fields** David Hilbert,2013-03-14 Constance Reid in Chapter VII of her book Hilbert tells the story of the writing of the Zahlbericht as his report entitled Die Theorie der algebra is chen Zahlkorper has always been known At its annual meeting in 1893 the

Deutsche Mathematiker Vereinigung the German Mathematical Society invited Hilbert and Minkowski to prepare a report on the current state of affairs in the theory of numbers to be completed in two years The two mathematicians agreed that Minkowski should write about rational number theory and Hilbert about algebraic number theory Although Hilbert had almost completed his share of the report by the beginning of 1896 Minkowski had made much less progress and it was agreed that he should withdraw from his part of the project Shortly afterwards Hilbert finished writing his report on algebraic number fields and the manuscript carefully copied by his wife was sent to the printers The proofs were read by Minkowski aided in part by Hurwitz slowly and carefully with close attention to the mathematical exposition as well as to the type setting at Minkowski s insistence Hilbert included a note of thanks to his wife As Constance Reid writes The report on algebraic number fields exceeded in every way the expectation of the members of the Mathemati cal Society They had asked for a summary of the current state of affairs in the theory They received a masterpiece which simply and clearly fitted all the difficult developments of recent times into an elegantly integrated theory Cyclotomic Fields II S. Lang,2012-12-06 This second volume incorporates a number of results which were discovered and or systematized since the first volume was being written Again I limit myself to the cyclotomic fields proper without introducing modular func tions As in the first volume the main concern is with class number formulas Gauss sums and the like We begin with the Ferrero Washington theorems proving Iwasawa s conjecture that the p primary part of the ideal class group in the cyclotomic Zp extension of a cyclotomic field grows linearly rather than exponentially This is first done for the minus part the minus referring as usual to the eigenspace for complex conjugation and then it follows for the plus part because of results bounding the plus part in terms of the minus part Kummer had already proved such results e g if p h then p h These are now formulated in ways applicable to the Iwasawa invariants following Iwasawa himself After that we do what amounts to Dwork theory to derive the Gross Koblitz formula expressing Gauss sums in terms of the p adic gamma function This lifts Stickel berger s theorem p adically Half of the proof relies on a course of Katz who had first obtained Gauss sums as limits of certain factorials and thought of using Washnitzer Monsky cohomology to prove the Gross Koblitz formula **Cyclotomic Fields and Zeta Values** John Coates,R. Sujatha,2006-10-03 Cyclotomic fields have always occupied a central place in number theory and the so called main conjecture on cyclotomic fields is arguably the deepest and most beautiful theorem known about them It is also the simplest example of a vast array of subsequent unproven main conjectures in modern arithmetic geometry involving the arithmetic behaviour of motives over p adic Lie extensions of number fields These main conjectures are concerned with what one might loosely call the exact formulae of number theory which conjecturally link the special values of zeta and L functions to purely arithmetic expressions Written by two leading workers in the field this short and elegant book presents in full detail the simplest proof of the main conjecture for cyclotomic fields Its motivation stems not only from the inherent beauty of the subject but also from the wider arithmetic interest of these questions The masterly exposition is intended to be accessible to

both graduatestudents and non experts in Iwasawa theory Introduction to Cyclotomic Fields Lawrence C Washington,1982-04-13 Algebraic Number Theory Serge Lang,1994-06-24 This is a second edition of Lang s well known textbook It covers all of the basic material of classical algebraic number theory giving the student the background necessary for the study of further topics in algebraic number theory such as cyclotomic fields or modular forms Lang s books are always of great value for the graduate student and the research mathematician This updated edition of Algebraic number theory is no exception MATHEMATICAL REVIEWS 13 Lectures on Fermat's Last Theorem Paulo Ribenboim,1979-12-18 Fermat s problem also ealled Fermat s last theorem has attraeted the attention of mathematieians far more than three eenturies Many clever methods have been devised to attaek the problem and many beautiful theories have been ereated with the aim of proving the theorem Yet despite all the attempts the question remains unanswered The topie is presented in the form of leetures where I survey the main lines of work on the problem In the first two leetures there is a very brief deseription of the early history as well as a seleetion of a few of the more representative reeent results In the leetures whieh follow I examine in sue eession the main theories eonneeted with the problem The last two lee tu res are about analogues to Fermat s theorem Some of these leetures were aetually given in a shorter version at the Institut Henri Poineare in Paris as well as at Queen s University in 1977 I endeavoured to produee a text readable by mathematieians in general and not only by speeialists in number theory However due to a limitation in size I am aware that eertain points will appear sketehy Another book on Fermat s theorem now in preparation will eontain a eonsiderable amount of the teehnieal developments omitted here It will serve those who wish to learn these matters in depth and I hope it will clarify and eomplement the present volume

Encyclopaedia of Mathematics M. Hazewinkel,2013-12-01 Encyclopaedia of Mathematics Michiel Hazewinkel,2013-12-01 This ENCYCLOPAEDIA OF MATHEMATICS aims to be a reference work for all parts of mathematics It is a translation with updates and editorial comments of the Soviet Mathematical En cyclopaedia published by Soviet Encyclopaedia Publishing House in five volumes in 1977 1985 The annotated translation consists of ten volumes including a special index volume There are three kinds of articles in this ENCYCLOPAEDIA First of all there are survey type articles dealing with the various main directions in mathematics where a rather fine subdivision has been used The main requirement for these articles has been that they should give a reasonably complete up to date account of the current state of affairs in these areas and that they should be maximally accessible On the whole these articles should be understandable to mathe matics students in their first specialization years to graduates from other mathematical areas and depending on the specific subject to specialists in other domains of science engineers and teachers of mathematics These articles treat their material at a fairly general level and aim to give an idea of the kind of problems techniques and concepts involved in the area in question They also contain background and motivation rather than precise statements of precise theorems with detailed definitions and technical details on how to carry out proofs and constructions The second kind of article of medium length contains more

detailed concrete problems results and techniques **Encyclopaedia of Mathematics (set)** Michiel Hazewinkel,1994-02-28 The Encyclopaedia of Mathematics is the most up to date authoritative and comprehensive English language work of reference in mathematics which exists today With over 7 000 articles from A integral to Zygmund Class of Functions supplemented with a wealth of complementary information and an index volume providing thorough cross referencing of entries of related interest the Encyclopaedia of Mathematics offers an immediate source of reference to mathematical definitions concepts explanations surveys examples terminology and methods The depth and breadth of content and the straightforward careful presentation of the information with the emphasis on accessibility makes the Encyclopaedia of Mathematics an immensely useful tool for all mathematicians and other scientists who use or are confronted by mathematics in their work The Enclyclopaedia of Mathematics provides without doubt a reference source of mathematical knowledge which is unsurpassed in value and usefulness It can be highly recommended for use in libraries of universities research institutes colleges and even schools *Algebraic Numbers--I-II.* National Research Council (U.S.). Committee on Algebraic Numbers,1923 *Algebraic Numbers* National Research Council (U.S.). Committee on Algebraic Numbers,Leonard Eugene Dickson,Howard Hawks Mitchell,Harry Shultz Vandiver,1923 **Bulletin of the National Research Council** ,1927 **Algebraic Number Theory** John Coates,1989 **Bulletin of the American Mathematical Society** American Mathematical Society,1930 Lectures in Abstract Algebra: Theory of fields and Galois theory Nathan Jacobson,1964 The three volume Lectures are based on Jacobson s graduate lectures on algebra at Johns Hopkins and Yale in the 1940 s and early 1950 s and are very careful comprehensive and classical in style giving a general treatment of abstract algebra The first volume gives a comprehensive introduction to abstract algebra and its basic concepts The second volume deals with the theory of vector spaces accompanied by examples and exercises The third and final volume addresses field theory and Galois theory and is not an easy read for the casual student but a serious student who works at the material will be repaid for their efforts All volumes include a considerable number of exercises are given that vary greatly in difficulty while the texts in general are example driven and user friendly

Cyclotomic Fields Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has be apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Cyclotomic Fields**," written by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we will delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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