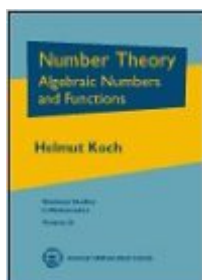# Number Theory: Algebraic Numbers And Functions (Graduate Studies In Mathematics)

Synopsis

Algebraic number theory is one of the most refined creations in mathematics. It has been developed by some of the leading mathematicians of this and previous centuries. The primary goal of this book is to present the essential elements of algebraic number theory, including the theory of normal extensions up through a glimpse of class field theory. Following the example set for us by Kronecker, Weber, Hilbert and Artin, algebraic functions are handled here on an equal footing with algebraic numbers. This is done on the one hand to demonstrate the analogy between number fields and function fields, which is especially clear in the case where the ground field is a finite field. On the other hand, in this way one obtains an introduction to the theory of "higher congruences" as an important element of "arithmetic geometry". Early chapters discuss topics in elementary number theory, such as Minkowski's geometry of numbers, public-key cryptography and a short proof of the Prime Number Theorem, following Newman and Zagier. Next, some of the tools of algebraic number theory are introduced, such as ideals, discriminants and valuations. These results are then applied to obtain results about function fields, including a proof of the Riemann-Roch Theorem and, as an application of cyclotomic fields, a proof of the first case of Fermat's Last Theorem. There are a detailed exposition of the theory of Hecke L-series, following Tate, and explicit applications to number theory, such as the Generalized Riemann Hypothesis. Chapter 9 brings together the earlier material through the study of quadratic number fields. Finally, Chapter 10 gives an introduction to class field theory.

Book Information

Teaching

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