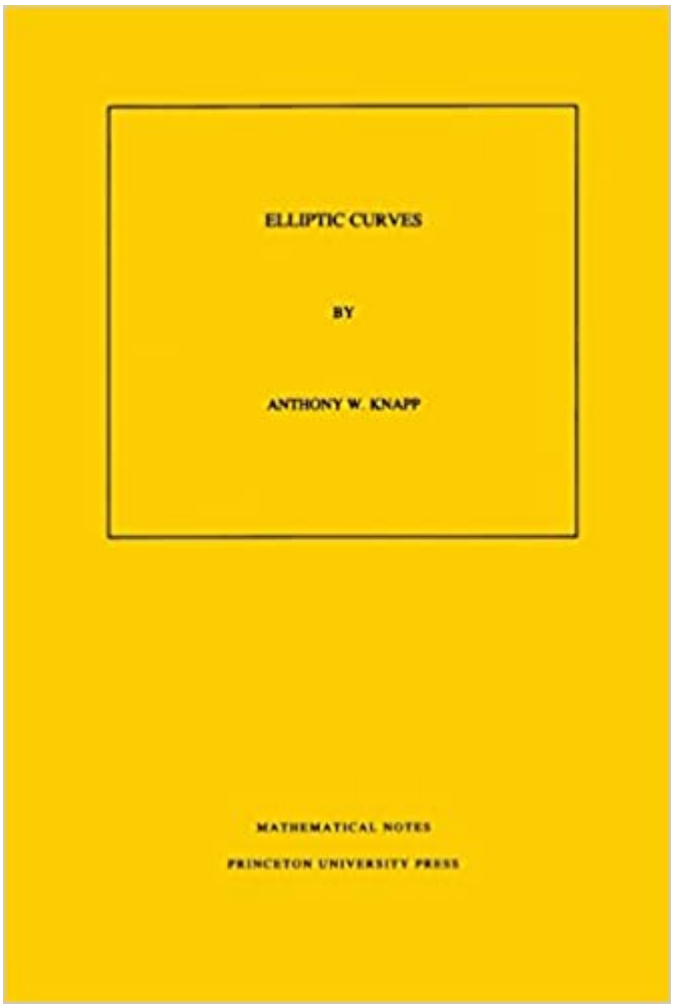
Elliptic Curves. (MN-40)



Synopsis

An elliptic curve is a particular kind of cubic equation in two variables whose projective solutions form a group. Modular forms are analytic functions in the upper half plane with certain transformation laws and growth properties. The two subjects--elliptic curves and modular forms--come together in Eichler-Shimura theory, which constructs elliptic curves out of modular forms of a special kind. The converse, that all rational elliptic curves arise this way, is called the Taniyama-Weil Conjecture and is known to imply Fermat's Last Theorem. Elliptic curves and the modeular forms in the Eichler- Shimura theory both have associated L functions, and it is a consequence of the theory that the two kinds of L functions match. The theory covered by Anthony Knapp in this book is, therefore, a window into a broad expanse of mathematics--including class field theory, arithmetic algebraic geometry, and group representations--in which the concidence of L functions relates analysis and algebra in the most fundamental ways. Developing, with many examples, the elementary theory of elliptic curves, the book goes on to the subject of modular forms and the first connections with elliptic curves. The last two chapters concern Eichler-Shimura theory, which establishes a much deeper relationship between the two subjects. No other book in print treats the basic theory of elliptic curves with only undergraduate mathematics, and no other explains Eichler-Shimura theory in such an accessible manner.

Book Information

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Customer Reviews

Anthony W. Knapp is Professor of Mathematics at the University of New York, Stony Brook. He is the author of Representation Theory of Semisimple Groups: An Overview Based on Examples and Lie Groups, Lie Algebras, and Cohomology (both published by Princeton University Press).

Usually the Princeton Notes are written for specialists in the field. This book by Knapp is a definite exception. The didactic quality is excellent, and the background assumed of the reader is meager compared to what you can take away by reading this book. The reader is only assumed to have an undergraduate background in complex analysis and modern algebra...not bad considering the frontiers that Knapp reaches in this book. The Eichler-Shimura thoery is treated in the next to last chapter of the book, and at a very understandable level. After reading the book one takes away an understanding of many deep results in the theory of elliptic curves. The author gives the reader a rare gift for most modern mathematical texts: insight. Proofs are given for most of the results, but the main emphasis is on understanding how elliptic curves are studied and why they are useful mathematical objects. This is definitely a book to be read by everyone interested in the theory of elliptic curves. String theorists, cryptoanalysts, physicists, and aspiring mathematicians whose interests and applications are in the theory of elliptic curves should definitely read this book. A mere $50.00 will get you a copy...but it is definitely worth four times that. If you are coming to the theory of elliptic curves for the first time and have a background in comnplex analysis and modern algebra, read first Joseph Silverman's book on rational points on elliptic curves, and then Knapp's book. Then move on to Silverman's two books on the arithmetic of elliptic curves. For both theory and applications, this sequence should prepare anyone for entering this very interesting world of elliptic curves. If only more books in modern mathematics were written like Knapp's Elliptic Curves.....

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