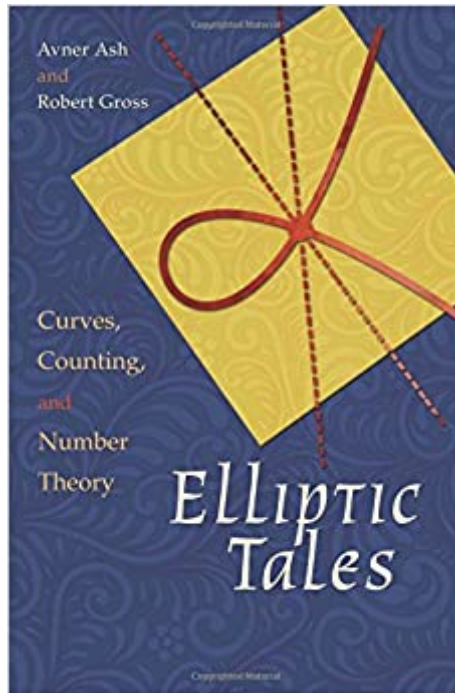


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# Elliptic Tales: Curves, Counting, And Number Theory



## Synopsis

Elliptic Tales describes the latest developments in number theory by looking at one of the most exciting unsolved problems in contemporary mathematics—the Birch and Swinnerton-Dyer Conjecture. In this book, Avner Ash and Robert Gross guide readers through the mathematics they need to understand this captivating problem. The key to the conjecture lies in elliptic curves, which may appear simple, but arise from some very deep—and often very mystifying—mathematical ideas. Using only basic algebra and calculus while presenting numerous eye-opening examples, Ash and Gross make these ideas accessible to general readers, and, in the process, venture to the very frontiers of modern mathematics.

## Book Information

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## Customer Reviews

"The authors present their discussion in an informal, sometimes playful manner and with detail that will appeal to an audience with a basic understanding of calculus. This book will captivate math enthusiasts as well as readers curious about an intriguing and still unanswered question."--Margaret Dominy, Library Journal

"Minimal prerequisites and its clear writing make this book (which even has a few exercises) a great choice for a seminar for mathematics majors, who at some point should have such an excursion to one of the frontiers of mathematics."--Mathematics Magazine

"The authors of Elliptic Tales do a superb job in demonstrating the approach that mathematicians take when they confront unsolved problems involving elliptic curves."--Sungkon Chang, Times Higher Education

"One cannot help being impressed, in reading the book and pursuing a few of the

references, by the magnitude of the enterprise it chronicles."--James Case, SIAM News

Ash and Gross thoroughly explain the statement and significance of the linchpin Birch and Swinnerton-Dyer conjecture. . . . [A]sh and Gross deliver ample and current intellectual and technical substance."--Choice

I would envision this book as an excellent text for an undergraduate 'capstone' course in mathematics; the book lends itself to independent reading, but topics may be explored in much greater depth and rigor in the classroom. Additionally, the book indeed brings together ideas from calculus, complex variables and algebra, showing how a single mathematical research question may require an integrated understanding of the various branches of mathematics. Thus, it encourages students to reinforce their understanding of these various fields, while simultaneously introducing them to an open question in mathematics and a vibrant field of study."--Lisa A. Berger, Mathematical Reviews Clippings

The book is very pleasantly written, and in my opinion, the authors have done an admirable job in giving an idea to non-experts what the Birch-Swinnerton Dyer conjecture is about."--Jan-Hendrik Evertse, Zentralblatt MATH

The book's most important contributions . . . are the sense of discovery, invention, and insight into the habits of mind used by mathematicians on this journey. I would recommend this book to anyone who wants to be challenged mathematically or who wants to experience mathematics as creative and exciting."--Jacqueline Coomes, Mathematics Teacher

[T]his book is a wonderful introduction to what is arguably one of the most important mathematical problems of our time and for that reason alone it deserves to be widely read. Another reason to recommend this book is the opportunity to share in the readily apparent joy the authors have for their subject and the beauty they see in it, not least because . . . joy and beauty are the most important reasons for doing mathematics, irrespective of its dollar value."--Rob Ashmore, Mathematics Today

This book has many nice aspects. Ash and Gross give a truly stimulating introduction to elliptic curves and the BSD conjecture for undergraduate students. The main achievement is to make a relative easy exposition of these so technical topics."--Jonathan Sanchez-Hernandez, Mathematical Society

A carefully thought out presentation."--Danny Yee, Danny Reviews

"Assuming only what every mathematically inclined freshman should know, this book leads the reader to an understanding of one of the most important conjectures in current number theory--whose proof is one of the Clay Mathematics Institute's million-dollar prize problems. The book is carefully and clearly written, and can be recommended without hesitation."--Peter Swinnerton-Dyer, University of Cambridge

The Birch and Swinnerton-Dyer Conjecture is one of the great insights in number theory from the twentieth century, and Ash and Gross write with care and a

clear love of the subject. Elliptic Tales will have wide appeal."--Peter Sarnak, Princeton University

If anyone ever asks you (assuming you have a degree in math), "what do mathematicians actually do?" this is a good book to hand to them. It covers the basics of elliptic curves using as little machinery as possible. I agree with other reviewers that reading this book requires a certain level of mathematical maturity beyond what a typical student gets out of a basic calculus course, but anyone with enough gumption can work through the material. The authors are careful to develop concepts as needed, but no more than that. For example, groups and finite fields get a nice elementary treatment. I found reading this book to be a real joy. I also recommend it to anyone with a degree in math who is curious about why elliptic curves are so important in the field of algebraic geometry. I deducted one star for overselling who can comfortably read this book, but I still highly recommend it for readers who want to know something about elliptic curves--they are, after all, how Fermat's Last Theorem fell! To be clear, you won't be anywhere near understanding the proof Wiles developed for FLT, but the concept of rational points on elliptic curves is where it all begins.

This is one of very few non-textbooks I have read on Mathematics. This short book is written in everyday language requiring little more than an understanding of the concept of function,  $y = f(x)$ ,  $z = F(x,y)$ , or even  $F(x,y,z) = 0$ . A short review of these topics and the basic algebra of lines in a plane,  $y = mx + b$ , is all the interested reader needs to delve quite deeply into one of the most intriguing areas of modern mathematics. For the amateur mathematician, perhaps a college math major or minor who has been away from formal mathematics since graduation, will find this an easy read, a quite informal treatise of this branch of Modern Mathematics. Specifically, the book prepares the reader for his first introduction to the "Birch and Swinnerton-Dyer (no relation) Conjecture which proposes that under certain conditions the algebraic and geometric degrees of a curve  $C$ , are equal. Elliptic Tales: Curves, Counting, and Number Theory

This is a very good book and covers a lot of material including background. Like many semi-popular math books on a topic, they sometimes explain in detail pretty simple things as if the reader needs that, but then make the assumption that the reader is already clear on things that are much more advanced. They do explain it but a reader could get lost and have to go back. A better index would help with that. Well worth reading.

Great stuff

This is the only book about elliptic curves that I know of that is accessible to undergraduate math majors. I have been reading it with one of my students and I cannot recommend it more highly!

Best explanation of elliptic curves I have found. Does not assume much in the way of prior knowledge. Provides motivation as well as technical development.

I'm trying to solve this BSD-conjecture, this book gave me some sort of ideas and different points of view of this famous unsolved mathematical problem. A great book.

Around 1961 very extensive computer experiments carried out by Bryan Birch and Peter Swinnerton-Dyer of the Cambridge University Mathematics Department in England revealed a new apparent phenomenon in number theory. This, now called the BSD conjecture, has turned out to be a central theme of immense difficulty with work on it still going on. The same is true of the better-known Riemann Hypothesis, which is three times as old. Minimal biographical information on the principal participants is given. Instead the basics of BSD are explained to those with good scientific background. Of course the more you know already the less time you need to put into the earlier chapters. Overall the choice of topics seems appropriate and the presentation is first class.

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