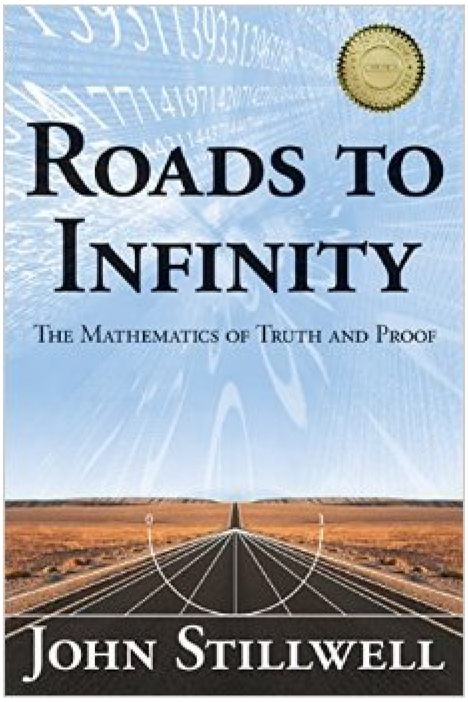
Roads To Infinity: The Mathematics Of Truth And Proof



Synopsis

Winner of a CHOICE Outstanding Academic Title Award for 2011!This book offers an introduction to modern ideas about infinity and their implications for mathematics. It unifies ideas from set theory and mathematical logic, and traces their effects on mainstream mathematical topics of today, such as number theory and combinatorics. The treatment is historical and partly informal, but with due attention to the subtleties of the subject. Ideas are shown to evolve from natural mathematical questions about the nature of infinity and the nature of proof, set against a background of broader questions and developments in mathematics. A particular aim of the book is to acknowledge some important but neglected figures in the history of infinity, such as Post and Gentzen, alongside the recognized giants Cantor and GÃ¶del.

Book Information

File Size: 10680 KB
Print Length: 250 pages
Publisher: A K Peters/CRC Press (July 13, 2010)
Publication Date: July 13, 2010
Sold by:Â Digital Services LLC
Language: English
ASIN: B00UVAPWJI
Text-to-Speech: Not enabled
X-Ray: Not Enabled
Word Wise: Not Enabled
Lending: Not Enabled
Enhanced Typesetting: Not Enabled
Best Sellers Rank: #963,409 Paid in Kindle Store (See Top 100 Paid in Kindle Store)   #31 inÂ Kindle Store > Kindle eBooks > Nonfiction > Science > Mathematics > Pure Mathematics > Set Theory   #105 inÂ Books > Science & Math > Mathematics > Infinity   #113 inÂ Kindle Store > Kindle eBooks > Nonfiction > Science > Mathematics > Recreation & Games

Customer Reviews

[The other "MidWest Book Review" seems to miss the main point of the book and doesn’t do justice to it.]This book is not original research, but is still a great book because it opened my eyes to some very important maths about logic that I’ve overlooked. As the title says, it’s about truth and proof. It surprised me that the "strength" of proof systems is somehow related to transfinite numbers.Chapter

1: Aleph_0 is the cardinality of the integers. 2^Aleph_0 is the cardinality of the continuum (ie, the real line). By Cantor's diagonal argument we know there is no 1-1 correspondence between the integers and the reals.Chapter 2: Cantor's theory of infinite ordinals. We can count from 1,2,3,... to infinity, and BEYOND that, is the first transfinite ordinal, that Cantor denotes as omega. Then we can carry on counting with omega + 1, omega + 2, omega +3, ..., to omega * 2. This process goes on to omega * 3, omega * 4, ..., and to omega^2, omega^3, ..., omega^omega, omega^omega^omega, ..., and eventually to omega raised to omega an infinite number of times, but it still doesn't end. The next ordinal is epsilon_0, and these countable ordinals go "inconceivably far beyond" epsilon_0. This results in Aleph_1, the first UNCOUNTABLE ordinal, and it still doesn't end!The continuum hypothesis asks whether 2^Aleph_0 = Aleph_1. It is still unsolved, but Cohen believes that it is highly unlikely to be true. Godel proved that CH is consistent with standard Zermelo-Frankel set theory. Cohen (the inventor of "forcing") proved that it cannot be proved in ZF.All this is explained very clearly in the book; my summary is lousy.

John Stillwell's "Roads to Infinity" sounds like another "GÃ¶del's theorem" book. Yes, it mentions it and gets into GÃ¶del's famous theorems, a little bit. But, he just finds a simple alternative; he doesn't mention GÃ¶del numbering. I've been through say Nagel's "GÃ¶del's Proof." But, even then, I don't recall all this stuff about ordinals. John Stillwell shows George Cantor's genius a lot more by showing the Fourier analyses roots of his ideas and George Cantor's ordinal numbers work. This is just a start of what you can get from here, if you're not a phd logician/mathematician.If you think George Cantor's transfinite numbers is mindblowing, his work on ordinals to analyse infinit cardinal numbers is . . . it shows how one can analyse infinity far more than most people could ever dream.I'd like to say, that as usual, in John Stillwell's works, he always finds some modern easier short proof of results; otherwise, he references off. He gives examples when he can find easy examples, and just mentions hard problems(mostly in chapter supplements where they belong).In John Stillwell's other works, he loves to point out the induction definitions of arithmetic; in this book, he gives a lot more reason to take those seriously!Historically, one of the major reasons for proof was the inability to deal with infinity. Here, John Stillwell shows the affect infinity has had on proof. I think logical proof has proven to be more than we thought through the ages, so I don't think one should consider syllogisms discredited by modern studies of infinity and proof. But, I do like the recent results of the interplay between finite and infinit. And John's book . . .

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