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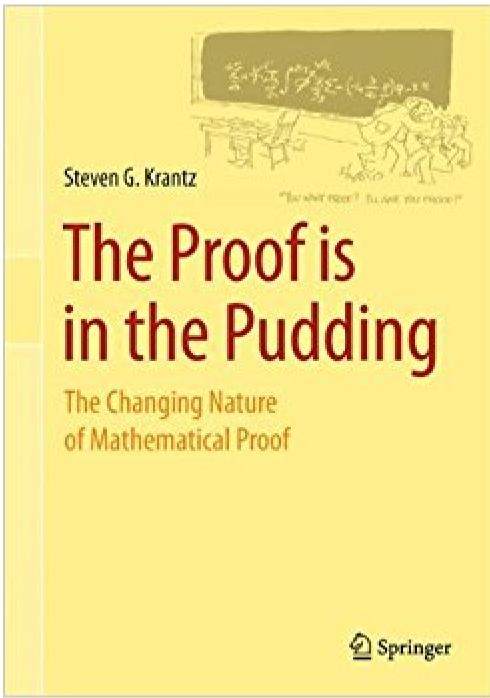
The Proof Is In The Pudding: The Changing Nature Of Mathematical Proof



Synopsis

This text explores the many transformations that the mathematical proof has undergone from its inception to its versatile, present-day use, considering the advent of high-speed computing machines. Though there are many truths to be discovered in this book, by the end it is clear that there is no formalized approach or standard method of discovery to date. Most of the proofs are discussed in detail with figures and equations accompanying them, allowing both the professional mathematician and those less familiar with mathematics to derive the same joy from reading this book.

Book Information

Hardcover: 264 pages
Publisher: Springer; 2011 edition (May 17, 2011)
Language: English
ISBN-10: 0387489088
ISBN-13: 978-0387489087
Product Dimensions: 10.1 x 7.3 x 1.1 inches
Shipping Weight: 2 pounds (View shipping rates and policies)
Average Customer Review: 3.6 out of 5 stars 2 customer reviews
Best Sellers Rank: #651,025 in Books (See Top 100 in Books) #87 inÂ Books > Science & Math > Mathematics > Number Systems #320 inÂ Books > Science & Math > Mathematics > Pure Mathematics > Logic #433 inÂ Books > Science & Math > Physics > Mathematical Physics

Customer Reviews

â œThis book is to describe the essence, nature, and methodology of mathematical proof, with a strong emphasis on the change of these concepts in time. â | It is written in a very clear and suggestive manner that makes the reading pleasant and rewarding â | . Any reader will notice that the author has reached this goal in very convincing way, and the outcome is a brilliant work which should be found in every math library and department office.â • (JÃ rgen Appell, zbMATH 1318.00005, 2015)â œIn this book Steven Krantz undertakes the Miltonic task of justifying the ways of (pure) mathematicians to the world at large. â | The concept of mathematical proof is at the heart of Krantzâ ™s book. â | mathematicians should find the book interesting, illuminating, provocative â | .â • (J. M. Plotkin, Mathematical Reviews, Issue 2012 b)â œThe author traces the development of the idea of proof from Euclid through computer-aided and computer-generated proofs, pointing out the way some current social trends in mathematics affect the construction of nonstandard proofs. â |

This work provides good outside class reading for students--and not just mathematics majors; one could easily imagine this as a supplement to courses on the history or philosophy of science. Summing Up: Recommended. Lower-division undergraduates through researchers/faculty; general readers.â • (D. Robbins, Choice, Vol. 49 (2), October, 2011)â œKrantzâ ™s book is entertaining, can be read by the early undergraduate and puts forward some serious issues. There are few math books that are useful and valuable reading for all mathematicians, but this is one of them.â • (Charles Ashbacher, The Mathematical Association of America, June, 2011)

Krantzâ ™s book covers the full history and evolution of the proof concept.Â Â The notion of rigorous thinking has evolved over time, and this book documents that development.Â Â It gives examples both of decisive developments in the technique of proof and also of magnificent blunders that taught us about how to think rigorously.Â Many historical vignettes illustrate the concepts and acquaint the reader with how mathematicians think and what they care about.In modern times, strict rules for generating and recording proof have been established.Â At the same time, many new vectors and forces have had an influence over the way mathematics is practiced.Â Certainly the computer plays a fundamental role in many mathematical investigations.But there are also fascinating social forces that have affected the way that we now conceive of proof.Â Â Daniel Gorensteinâ ™s program to classify the finite simple groups, Thomas Halesâ ™sÂ resolution of the Kepler sphere-packing problem, Louis de Brangesâ ™s proof of the Bieberbach conjecture, and Thurstonâ ™s treatment of the geometrization program are but some examples of mathematical proofs that were generated in ways inconceivable 100 years ago.Â Krantz treats all of them---and more---in some detail; he names the players and tells all the secrets.Many of the proofs treated in this book are described in some detail, with figures and explanatory equations. The reader is given a dose of modern mathematics, and how mathemati

I haven’t yet looked into it much, but my husband found a lot of interesting facts in it. It does tell one something about how the concept of proof has changed over time.

This is an entertaining book, although not entirely in ways that you might expect. Although it certainly includes discussions of proofs, there is as much about mathematicians and their quirks as there is about the proofs that they write.As with so many books nowadays, it is hard to believe that anyone read the final draft, let alone copy-edited it. (Are there any copy-editors left?) On page 101, we learn that measure theory was "pioneered" by Lebesgue in 1901. This may come as a surprise because we have just read, earlier on the same page, that measure theory was "invented" by Kolmogorov, who was born in 1903. A footnote on page 160 tells the story of "quasithin" groups: a problem first identified as a "gap" was subsequently filled by a two-volume tome of 1200 pages. This anecdote is repeated, almost verbatim, in the text on page 163. There are many typographical errors, though few will lead the reader astray.Naturally, the usual favourites are included. Krantz gives the conventional proof that the square root of two is irrational. He mentions Apostol's elegant visual proof but, sadly, does not show it. Pythagoras' theorem gets a proof and the claim that there are "well over 50 proofs altogether" - an understatement, considering that one book alone (Loomis's 'The Pythagorean Proposition') contains 367 proofs. Dirichlet's approximation theorem provides a nice example of a deep result with a straightforward proof (not given in the book, however) using the pigeonhole principle.The book discusses may results anecdotally - who made the conjecture, who tried to prove it but failed, who finally proved the theorem, how many hundreds of pages of proof were required, etc. - but only Brouwer's fixed point theorem gets more than a superficial treatment.The fifth chapter is entitled "Hilbert and the Twentieth Century" and begins with a one-page section about Hilbert. The next section starts with Birkhoff and Wiener then segues into a long and somewhat unnecessary paean about the excellence of American mathematics. The chapter continues with Brouwer, the ham sandwich theorem, proof by contradiction, constructive analysis, Bourbaki, Ramanujan, Erdos, Halmos, and paradoxes - altogether a bit of a hodge-podge. Subsequent chapters cover the four-colour theorem, computer-generated proofs, and "elusive" proofs: the Riemann Hypothesis, Goldbach Conjecture, P=NP, Fermat's Last Theorem, and other old friends. Mixed in with these are diatribes about Wolfram, Mandelbrot, and Penrose, perhaps because they have failed to come up with nifty proofs.Krantz's treatment of Euclid's Theorem contains a rather basic error that I have seen elsewhere. He starts with the assumption that the set of primes is finite, say S = , constructs P = P1 x P2 x ... x Pn + 1, and observes that P is not divisible by any of the primes. So far, so good. He then says that "the only possible conclusion is that P is another prime", which is not so. There are two possibilities: either P is prime, or it is composite with prime factors that are not in S. Either case contradicts the original assumption.Mathematicians - and Krantz is most certainly a mathematician - do not make mistakes like this. Perhaps Euclid's proof is so "obvious" that mathematicians repeat it on autopilot: but that also would be uncharacteristic. My guess is that they are paraphrasing an ur-theorem that postulates a finite set S of natural numbers with the property that every natural number is either a member of S or can be factored into members of S. Then P, constructed as above, has neither property, hence the contradiction.Krantz mentions, but does not dwell on, metamathematics. He demonstrates, successfully I believe, that proof is a social process: a theorem is proved when mathematicians agree that a correct proof has been found. Proofs that depend on computer programs are causing unease, and even outright rejection in some cases, but have not yet changed the conventions of publication established in the seventeenth century. He also explains that the proof of a theorem is expected to provide insight into why the theorem is true.In summary, this book is a good, quick read and would fit well in the paperback section of an airport bookstore. Sadly, it is a Springer hardcover and priced accordingly.

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