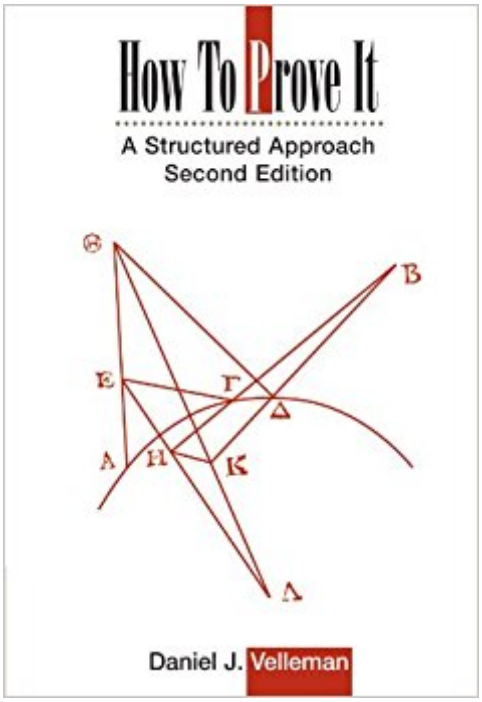
How To Prove It: A Structured Approach, 2nd Edition



Synopsis

Geared to preparing students to make the transition from solving problems to proving theorems, this text teaches them the techniques needed to read and write proofs. The book begins with the basic concepts of logic and set theory, to familiarize students with the language of mathematics and how it is interpreted. These concepts are used as the basis for a step-by-step breakdown of the most important techniques used in constructing proofs. To help students construct their own proofs, this new edition contains over 200 new exercises, selected solutions, and an introduction to Proof Designer software. No background beyond standard high school mathematics is assumed. Previous Edition Hb (1994) 0-521-44116-1 Previous Edition Pb (1994) 0-521-44663-5

Book Information

Paperback: 384 pages

Publisher: Cambridge University Press; 2nd edition (January 16, 2006)

Language: English

ISBN-10: 0521675995

ISBN-13: 978-0521675994

Product Dimensions: 6 x 0.9 x 9 inches

Shipping Weight: 1.7 pounds (View shipping rates and policies)

Average Customer Review: 4.4 out of 5 stars 114 customer reviews

Best Sellers Rank: #16,940 in Books (See Top 100 in Books) #3 inÃ Â Books > Science & Math > Mathematics > Pure Mathematics > Combinatorics #7 inÃ Â Books > Science & Math > Mathematics > Pure Mathematics > Logic #297 inÃ Â Books > Textbooks > Science & Mathematics > Mathematics

Customer Reviews

"The prose is clear and cogent ... the exercises are plentiful and are pitched at the right level.... I recommend this book very highly!" MAA Reviews"The book provides a valuable introduction to the nuts and bolts of mathematical proofs in general." SIAM Review"This is a good book, and an exceptionally good mathematics book. Thorough and clear explanations, examples, and (especially) exercised with complete solutions all contribute to make this an excellent choice for teaching yourself, or a class, about writing proofs." Brent Smith, SIGACT News

Beginning with the basic concepts of logic and set theory, this book teaches the language of mathematics and how it is interpreted. The author uses these concepts as the basis for a

step-by-step breakdown of the most important techniques used in constructing proofs. He shows how complex proofs are built up from these smaller steps, using detailed "scratch work" sections to expose the machinery of proofs about the natural numbers, relations, functions, and infinite sets. To give students the opportunity to construct their own proofs, this new edition contains over 200 new exercises, selected solutions, and an introduction to Proof Designer software.

Before buying this book, I struggled in math. I excelled at "calculating" stuff by simply plugging in numbers into some sort of equation our high school teachers would spoil us with, but when I got to college, I had to start thinking abstractly- and it bothered me a lot, because I had no idea how to test or prove the logic of some statement. I was doing very poorly in linear algebra and desperately needed help- lo and behold, my professors weren't helpful (at all). Someone recommended this proof writing book to me, and I am VERY grateful for that referral.The book takes the average student (it's shocking with how little math background one needs) and introduces him to basic boolean logic. You know, material like "If A is true, and B is false, then A implies B is false." In a discrete mathematics course, one would call this "truth tables." From there, the author takes the reader into set theory, basic proofs, group theory, etc- and into more advanced topics, like the Cantor-Schroeder-Bernstein theorem, countability, etc. So what makes this book stand out?(1) Readability. Many math professors stop just short of taking pride in how confusing, abstract, or daunting their lectures can be. Velleman, however, goes the extra mile in the text to see that the reader UNDERSTANDS the logical buildup and concepts of mathematical proofs. Sure, set theory can be confusing- but after reading several other texts in discrete math, including "Discrete Math and its Applications" by Kenneth Rosen (if you're reading this, no offense) I've found that Velleman by far writes the most comprehensive and cohesive explanations for understanding set theory. Making the material accessible is the mark of a real "teacher," and if you read through this book yourself, I believe you'd agree that Velleman is a pretty legit teacher.(2) Examples. There are plenty- plenty that Velleman works out himself. Reading the examples alone- and actually taking the time to understand them- is a task that's up to the reader, obviously, but they do show results almost immediately in understanding discrete math.(3) Problems (exercises). There's never a shortage of exercises, I found, as I tried to work through the problem set. There are plenty. Fortunately, there are some answers in the back, but just enough so that you can verify to see if you're understanding the material, and not enough so that you find yourself copying every answer in the back (even the best students get tempted to do that). Velleman gives the proper amount of answers in the back and a ton of exercises to do. If you complete them all properly, you'd be far

ahead of the curve amongst math majors.I know my review may have been too wordy, or too optimistic. However, my feelings are very honest and not exaggerated: this book is written so one can learn discrete mathematics, and really helps the reader understand what higher math is all about- and how mathematicians think, write, and communicate. This book deserves an A+, and I've only given that score out to a handful of books.

A fine book. It is very clear and concise, and in my opinion very enjoyable. It goes over the foundations needed to writing proofs (basic set theory and logic) and provides a lot of exercises and examples. The first chapters deal with the ideas of logic and sets and of the different ways of proving different types of statements. In the later chapters, extremely important math concepts that are not essential to proof writing are introduced - relations, functions, and infinite sets - providing more training in proof writing. The concept of induction (both ordinary and strong) is also introduced in the later chapters.The sections are mainly very clear and concise explanations of the concepts, together with examples, theorems, and definitions. Velleman is a fine proof writer; his proofs are very readable and it is very easy to understand them. Therefore it is very worthwhile to study them and perhaps to even try to mimic them, to some extent. The end of every section is a very large set of exercises. Some exercises have solutions in the back of the book, but beware that for most of them, no solution is provided. This is a great drawback, in my opinion, and I wonder why Velleman decided to leave so many exercises without a solution. However, the exercises are very good! The first exercises in every set are generally quite easy, and the last ones can be quite difficult. Many of them are very interesting.Here's a very interesting exercise from the section dealing with strong induction:"The martian monetary system uses colored beads instead of coins. A blue bead is worth 3 Martian credits, and a red bead is worth 7 Martian credits. Thus, three blue beads are worth 9 credits, and a blue and red bead together are worth 10 credits, but no combination of blue and red beads is worth 11 credits. Prove that for all natural numbers n greater than or equal to 12, there is some combination of blue and red beads that is worth n credits."

If you're new to mathematical proofs or making your first venture into real analysis this is an invaluable piece. It's incredibly well articulated and the examples/solutions are top notch learning tools. I've have the opportunity to compare this book to several other "Intro to Proofs" and it blows them all out of the water. I can't praise this book enough, it's been a total life saver. Everyone interested in self study should absolutely start with this one.

It’s basically exactly what I needed for my Mathematical Structures class, furthermore the textbook is thorough in it’s descriptions, explanations, and examples. I found that it really assisted when I needed assistance outside of class and I don’t regret buying it - if your teacher wants you to buy the book I suggest you do (it’s a lot more helpful than one would originally assume).

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