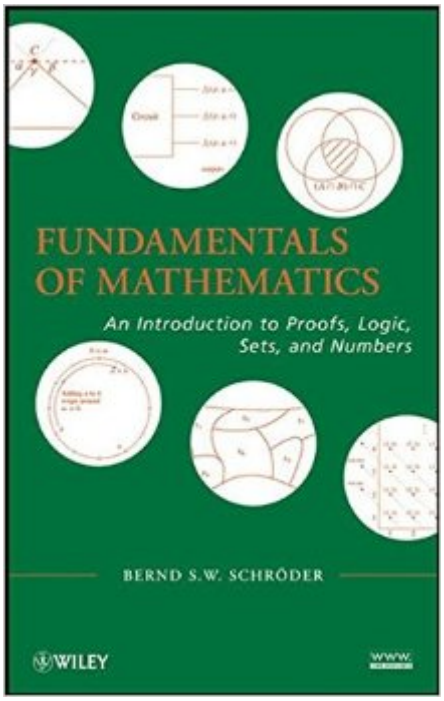
Fundamentals Of Mathematics: An Introduction To Proofs, Logic, Sets, And Numbers



Synopsis

An accessible introduction to abstract mathematics with an emphasis on proof writing Addressing the importance of constructing and understanding mathematical proofs, Fundamentals of Mathematics: An Introduction to Proofs, Logic, Sets, and Numbers introduces key concepts from logic and set theory as well as the fundamental definitions of algebra to prepare readers for further study in the field of mathematics. The author supplies a seamless, hands-on presentation of number systems, utilizing key elements of logic and set theory and encouraging readers to abide by the fundamental rule that you are not allowed to use any results that you have not proved yet. The book begins with a focus on the elements of logic used in everyday mathematical language, exposing readers to standard proof methods and Russell's Paradox. Once this foundation is established, subsequent chapters explore more rigorous mathematical exposition that outlines the requisite elements of Zermelo-Fraenkel set theory and constructs the natural numbers and integers as well as rational, real, and complex numbers in a rigorous, yet accessible manner. Abstraction is introduced as a tool, and special focus is dedicated to concrete, accessible applications, such as public key encryption, that are made possible by abstract ideas. The book concludes with a self-contained proof of Abel's Theorem and an investigation of deeper set theory by introducing the Axiom of Choice, ordinal numbers, and cardinal numbers. Throughout each chapter, proofs are written in much detail with explicit indications that emphasize the main ideas and techniques of proof writing. Exercises at varied levels of mathematical development allow readers to test their understanding of the material, and a related Web site features video presentations for each topic, which can be used along with the book or independently for self-study. Classroom-tested to ensure a fluid and accessible presentation, Fundamentals of Mathematics is an excellent book for mathematics courses on proofs, logic, and set theory at the upper-undergraduate level as well as a supplement for transition courses that prepare students for the rigorous mathematical reasoning of advanced calculus, real analysis, and modern algebra. The book is also a suitable reference for professionals in all areas of mathematics education who are interested in mathematical proofs and the foundation upon which all mathematics is built.

Book Information

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Customer Reviews

This book starts from the basics of writing proofs (logic, basic proof methods such as proof by contradiction) and proceeds through the foundations of mathematics (set theory, natural numbers, integers). In contrast to most beginning "proofs" books, it doesn't assume any properties of numbers, but derives everything starting with set theory. The book covers some abstract algebra along the way, but mainly in conjunction with number systems that have the corresponding properties (e.g. rings with integers, fields with rational numbers). It goes as far as construction of the real numbers via Dedekind cuts.The book then has a chapter with a complete proof of the unsolvability of the general quintic equation. This is amazingly ambitious for a book that starts at this level, and it's the shortest route I've seen to a proof of this famous result. (The chapter is about 50 pages long, and it draws on some results from earlier in the book, but not all that much. In contrast, the final step in the quintic proof is on page 629 in Dummit and Foote's dense Abstract Algebra.) It's still a long path, and given how little is assumed for prerequisites, some of the proofs along the way are cumbersome. The author has a web site with videos presenting the content of the book, and it's helpful to use the videos along with the book.On the plus side - if you want to cover a lot of mathematical proofs starting from the beginning, this is an excellent book. It covers topics in the foundations of mathematics that are normally treated at a more advanced level, and it covers a proof from abstract algebra that would normally be the culmination of a semester or even a year-long course.On the minus side - for a first book of proofs, it may be too ambitious for some.

Introduction to Advanced Mathematics: A Guide to Understanding Proofs The Joy of Sets: Fundamentals of Contemporary Set Theory (Undergraduate Texts in Mathematics) Fuzzy Sets and Fuzzy Logic: Theory and Applications Ones and Zeros: Understanding Boolean Algebra, Digital Circuits, and the Logic of Sets Introductory Logic and Sets for Computer Scientists (International Computer Science Series) Introduction to the Theory of Sets (Dover Books on Mathematics) Introduction to Logic: Propositional Logic, Revised Edition (3rd Edition) LOTTERY NUMBERS: 7 Numbers That WIN Most Often Good Math: A Geek's Guide to the Beauty of Numbers, Logic, and Computation (Pragmatic Programmers) Foundational Math Skills - 100 Numbers - Wildlife Coloring Book: Fun-Schooling with Art, Creativity & Logic - 1st, 2nd & 3rd Grades Apple Pro Training Series: Logic Pro 8 and Logic Express 8 Critical Thinking: Decision Making with Smarter Intuition and Logic! (Critical Thinking, Decision Making, Logic, Intuition) Set Theory (Studies in Logic: Mathematical Logic and Foundations) Logic: Propositional Logic (Quickstudy: Academic) Introduction to Logic: and to the Methodology of Deductive Sciences (Dover Books on Mathematics)