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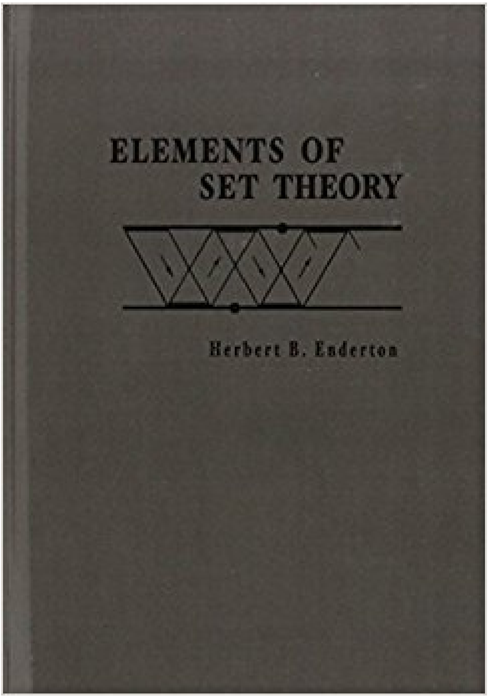
Elements Of Set Theory



ELEMENTS OF
SET THEORY

Herbert B. Enderton

Synopsis

This is an introductory undergraduate textbook in set theory. In mathematics these days, essentially everything is a set. Some knowledge of set theory is necessary part of the background everyone needs for further study of mathematics. It is also possible to study set theory for its own interest--it is a subject with intruiging results anout simple objects. This book starts with material that nobody can do without. There is no end to what can be learned of set theory, but here is a beginning.

Book Information

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Customer Reviews

This is an excellent book for undergraduates who are pursuing abstract mathematics for the first time. It provides the basic groundwork for students planning to study Real Analysis, Abstract Algebra, and Topology. Furthermore, it is a great reference book for anyone teaching or doing research in advanced mathematics.Topics covered in the book include: introduction to basic set theory; axioms and operations; relations and functions; natural numbers; construction of the real numbers; cardinal numbers; Axiom of Choice; orderings and ordinals; and countability.The price $53 is not bad for a new hardcover copy.

This book is the one. Zermelo-Fraenkel set theory is richly developed through the chapters and the exercises are intresting enough. They should republish this classic, it’s about to get sold out.

Great book and excellent service!

I strongly believe this book is uniquely among the introductory manuals because it offers the best motivation to (self-)study the marvelous subject of set theory. It’s not cheap, but it’s worth the price.

Introduction This book is one of the most assign textbooks for an introductory course in set theory. It is currently being assign for: Math 609 at Queens College, Math 135 at Berkeley, Math: M114S at UCLA, Math 361 at Rutgers, Ma 116 b at Caltech, among others. According to the preface, no specific background is presupposed. Hence, no knowledge of relations, functions, and numbers is needed. The reader does not need to know that 2 + 2 = 4 since it will be proved. However, the reader needs to be familiar with formal derivations involving quantifiers. For example, at the level of Chapters 5 and 10 fromÂ The Logic Book (4th Edition). I’m currently reading Enderton’s book to learn how to construct the number systems using some of the ZFC axioms in a First-order predicate logic. A useful supplement to consider is Mendelson’s "Number Systems and the Foundations of Analysis (Dover Books on Mathematics)". See my review. Note that whatever is proved in Mendelson’s book, also applies to this book since Mendelson uses the same axiomatic system. Another point to make is that Enderton himself ,on page 119, recommends Mendelson’s book as a reference.Summary of Chapters 1, 2, 3 and 4. The following axioms are introduced: (1)Extensionality, (2)Empty set, (3)Pairing, (4)Union, (5)Restricted comprehension(same as subset axiom), (6) power set and (7) Infinity. Equipped with these axioms, Enderton shows how to derive the existence of a Peano system. The set P is a Peano system if and only if there exists sets N, S, 0 such that P = with the following properties. (A) S is a one to one function from N into N. (B) 0 is contained in N. (C) 0 is not contained in the range of S. (D) If A is a subset of N with 0 contained in A such that whenever an arbitrary set x is in A implies that S(x) is in A, then A=N. The recursive/iteration theorem is then verified and followed by the proof that any two Peano systems are isomorphic. I did not like the proof that Mendelson gives for the recursive/iteration theorem and so I suggest the reader to see Enderton’s proof instead (see Enderton pg. 73). I find Enderton’s proof of the recursive/iteration theorem more natural and straightforward than Mendelson’s proof. However, Mendelson also gives a second form of the recursive/iteration theorem which he calls the recursion theorem. Enderton does not mentions the second form of the recursive theorem which goes like this: If F: N X Y -> Y with a in Y, then there exists a unique function H: N -> Y such that H(0)= a and for every element x in N implies H(S(x)) = F(). The proof of the recursion theorem that Mendelson gives is straightforward and vital to construct interesting functions like the factorial and sigma functions. Basic arithmetic like Addition, Multiplication and Exponentiation is also covered.

Enderton has nothing on sigma sums nor on polynomials. For theorems involving sigma sums and polynomials (like the binomial theorem), see section 4.9 fromÂ The Number Systems of AnalysisÂ or sections 3.4 and 4.4 fromÂ The Number Systems: Foundations of Algebra and Analysis.Summary of chapter 5Chapter 5 is about constructing the Real numbers. Both Enderton and Mendelson begin by constructing an order integral domain < Z, + , *, < > using equivalence class sets. However, Mendelson also offers an alternative construction by using a more direct approach. Under this "Direct approach" the set N of natural numbers is a subset of the set Z of integers (and not "just like" lol). Regardless of which approach the reader takes, Mendelson shows that any two well-order integral domains are isomorphic. Unfortunately Enderton does not covers basic properties of the integers such as greatest common divisors, exponentiation arithmetic, prime numbers, sigma sums, and polynomials. However, Mendelson does. Here is one interesting theorem that Enderton doesn’t states: If R is an equivalence relation on B and F: B X B -> B such that xRy and mRn implies F()RF(), then there exists a unique function H: B/R X B/R -> B/R such that H(< [a] , [b] >) = [F(< a , b >)] where a and b are elements of B. This theorem is crucial for justifying the uniqueness and existence of the functions +z , *z , +Q , *Q. See Enderton pg. 61 and 62 for further discussion(exercise 42). The rational numbers are constructed using equivalence class sets. The real numbers are constructed by using the so called "Dedekind Cuts". Mendelson also offers an alternative construction called the "Cauchy method" and shows that any two complete order fields are isomorphic. Furthermore, Chapter 5 starts looking like any other standard text on Real Analysis. Contrary to most standard texts on real analysis that tackles Real Analysis out of thin air, this book tackles Real Analysis from the Zermelo-Fraenkel axiomatic system.Summary of chapter 6,7,8Chapter 6 covers the basics of finite and infinite sets, countable and uncountable sets and a little bit on sequences. Interesting theorems that Enderton proves are, the Schroder-Bernstein theorem, as well as many equivalent forms of the Axiom of choice like Zorn’s lemma. Since my primary objective is to construct the number systems, I have not read chapters 7 and 8 so I can’t comment much on them right now. However, I do know that all of Enderton’s book is assumed knowledge inÂ Real Analysis, 3rd Edition.ConclusionHands down, this is the best introductory book on set theory that I have seen. I highly recommend this book to anyone interested in learning how to construct the number systems using some of the ZF axioms. As well as for those who need to learn set theory as a direct prerequisite for advance analysis like Measure Theory. If you want to become a God-Damm math genius for less than $40, then this book is a must read.

The book is nice and simple and well explained. The exercises problems are solvable and are not contest problems like in some books. Pretty much most of the other reviews have summed it up well. I can confidently say that among books written on Set Theory (like by Cohen, Halmos, Stoll, Hrbacek & Jech), that I bought and tried to read, this book is SIMPLY THE BEST introduction to Set Theory. Blindly read this book and no other book. It has enough set theory to get you going in pure mathematics.Addition to the review on 11/21/2012: I am close to being done with the arithmatic section and I must say that a book on set theory cannot possibly be better than this one. I have all the material I need to know in order to get a good start for Real Analysis. Those parts of the proof that he says "is left as an exercise" are truly trivial after following the material that is covered till that point. This book is SIMPLY THE BEST. Don’t think twice. Just get this book and read it top to bottom. There is a good reason why Stanford and Berkeley prescribe this book as the text for their Set Theory courses every year. I know that Hrbacek and Jech is one contender but I am very biased towards Enderton’s book as he makes this subject unbelievably simple where as other books (and definitely Halmos’s book) makes it seem harder than what it is.

I might sound biased, but who doesn’t? Enderton’s book is the BEST introduction out there if you want to learn. There are better books for conciseness or pendanticalness, what a word :(. But, he introduces the material in such a way that the novice can actual absorb most of it in one go through. It’s deep enough that a return trip through a difficult chapter is worth your time. After reading this text you can easily segueway to Moschovakis’s book, "Notes on Set Theory" or even attempt books like "Set Theory An Introduction To Independence Proofs (Studies in Logic and the Foundations of Mathematics)" by Kunen.This book covers all of the basics of set theory (greater in scope than Halmos’s "Naive Set Theory" (which is a great book by the way)).

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