

For Test 1 you should be familiar with all homework problems assigned in Asn 1, 2 & 3 as well as the theory covered up to and including Section 2.1 of the text.

You will not be expected to produce long, original proofs of challenging, never before seen propositions. I may, however, ask you to give a short proof or two of propositions that are new to you but which I consider basic and make use of the standard techniques we've seen (for example, showing two sets are equal by showing that each is a subset of the other, or using the definition of convergence of a sequence to prove that a given sequence converges to a particular limit.) You may also be asked to prove a result (or variation thereof) taken from the homework problems, or I may ask about some aspect of one of the proofs we worked through in class. In addition to the homework material, you should be familiar with the material outlined below.

## Definitions and Concepts

Be able to

1. State the well ordering property of  $\mathbb{N}$ .
2. Give precise definitions of the domain and range of a function.
3. Define what it means for a function to be injective, surjective, bijective.
4. Define (in reference to sets) cardinality, finite, countably infinite, countable, uncountable.
5. Define (in reference to sets) bounded above/below, least upper bound, greatest lower bound.
6. Define ordered set, and state what it means for an ordered set to have the least upper bound property.
7. State what a bounded function is.
8. State the Archimedean property of the real numbers.
9. State the definition of the limit of a sequence  $\lim_{n \rightarrow \infty} x_n$  and explain what it means for a sequence to converge.
10. State the definition of a monotone sequence.
11. State the definition of a subsequence.
12. For a particular sequence  $\{x_n\}_{n=1}^{\infty}$ , determine  $\lim_{n \rightarrow \infty} x_n$  and prove your result using the  $\epsilon, M$  definition.

## Theorems and Proofs

Know how to prove the following results:

1. Exercise 1.1.2.
2. Proposition 1.2.8.
3. Exercise 1.2.1
4. Exercise 1.3.8
5. Exercise 1.4.1
6. A convergent sequence has a unique limit (Prop. 2.1.6).
7. A convergent sequence is bounded (Prop. 2.1.7)
8. Proposition 2.1.17
9. Exercises 2.1.3 through 2.1.7 (including proofs) are nice test-style exercises