Math 341, Fall 2017
Review for Midterm 1

September 27, 2017

The midterm covers the material covered in sections 1.1-2.7 of the textbook. The format of the exam will be true/false questions and long answer questions. Work for each question must be done in the space provided. If you need paper for scratch work please bring this with you. The scratch paper will not be saved, however, so make sure your final work is on the exam.

Definitions to know:

1. Sets (p. 5)
2. Union (p. 5)
3. Intersection (p. 5)
4. Empty set (p. 5)
5. Disjoint sets (p. 5)
6. Complement (p 6)
7. Function (p. 7)
8. Axiom of Completeness (p. 15) ? not a definition, but you need to know it
9. Bounded above and least upper bound (p. 15)
10. Maximum and minimum (p 16)
11. Density (p. 23)
12.Injective and surjective functions (p. 25)
13. Countable and uncountable (p. 26)
14. Power set (p. 34)
15. Sequence (p. 42)
16. Convergence of a sequence (p. 43)
17. $\epsilon$-neighborhood (p. 43)
18. Bounded sequence (p. 49)
19. Increasing, decreasing, and monotone (p. 56)
20. Convergence of a series (p. 57)
21. Subsequence (p. 62)
22. Cauchy (p. 66)

Theorems to know:
You will need to know the statement and prove one of these theorems on the test.

1. Nested Interval Property (p. 20)
2. Monotone Convergence Theorem (p. 56)
3. Bolzano-Weierstrass Theorem (p. 64)

**You should be able to:**

1. Find the LUB and GLB of a set.

2. Compute, compare, and prove results on cardinality.

3. Prove that a sequence is converging using the definition.

4. Prove limit theorems for sequences (as in section 2.3).

5. Prove convergence for monotone sequences and show what the limit is (when possible).

6. Construct convergent subsequences and prove properties of subsequences.

7. Prove that a sequence is Cauchy and know the consequences.

8. Prove convergence for a series using the tests in section 2.7.

9. Prove basic properties of convergence for a series.

10. Prove statements similar to those in the homework. Know the theorems in the book (you don’t need to have them memorized, but you need to know what they say). Besides the list of theorems above that you should have memorized you should know the following (this is not an exhaustive list):

    - Archimedean property
    - Density of rationals in reals
    - The reals are uncountable
    - Uniqueness of limits
    - Algebraic limit theorems
    - Order limit theorems
    - Cauchy condensation test
    - Cauchy criterion