

## MATH 461: MATHEMATICAL LOGIC

**Professor:** Simon Thomas

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**Lectures:** MW4 1:40-3:00PM SEC-216

**Office hours:** M 11-12AM, W 3:30-4:30PM

**Homework.** Homework is collected each Wednesday.

**Grading.** The points for the final grade are distributed as follows.

- (1) Homework 10 %
- (2) First midterm 20 %
- (3) Second midterm 20 %
- (4) Final exam 50 %

**Optional Textbook:** Enderton, *A mathematical introduction to logic*, Academic Press.

### Topics covered:

- (1) **Elementary set theory.** After a review of the basic properties of functions and relations, we shall consider the notions of a countable and an uncountable set.
- (2) **Propositional logic.** In this section, we shall study propositional languages. We shall concentrate on trying to understand the meaning of the Compactness Theorem for propositional logic. Numerous applications of the Compactness Theorem will be presented, including an infinite analogue of the Four Color Theorem.
- (3) **First order logic.** In this section, we shall try to understand the relationship between the syntax and semantics of first order languages. This study will culminate in Gödel's Completeness and Compactness Theorems for first order logic.

- (4) **Applications of the Compactness Theorem.** In this section, we shall present various applications of the Compactness Theorem for first order logic, including the existence of nonstandard models of arithmetic.