# MA 3110: Logic and Proof
# Guidelines for Exam 1

Exam 1 covers material in sections 1.1–1.4 of our textbook, as well as any material discussed in class. The exam will consist of two parts: an in-class part and a take-home part.

## Part I: In-class exam

The in-class part of Exam 1 will take place on **Wednesday, February 25**. This portion of the exam will test your knowledge of definitions and basic concepts. You should be prepared to generate examples (for example, "provide an example of a proposition which is false;" although, I intend to ask you to provide examples that are more difficult than that). To be successful on the in-class portion of Exam 1 you should

- know the meaning of the term *proposition*
- be able to identify whether a given sentence is a proposition
- know what a *paradox* is
- know the logical definitions of *or*, *and*, *not*, *implies*, and *if and only if* in terms of truth tables
- be able to construct truth tables for compound propositions
- be able to identify a *tautology*
- be able to show that two propositions are *equivalent*
- know what the *inverse*, *converse*, and *contrapositive* of a conditional statements are and which one is equivalent to the original
- know how to negate statements involving *or*, *and*, and *implies* (see page 15)
- know the meaning of *open sentence* (or *predicate*)
- know the meaning of the universal (*for every*) and existential (*there exists . . . such that*) quantifiers and know how to negate statements involving quantifiers
- be able to represent a mathematical statement as a sentence in symbolic logic
- be able to translate a formula in symbolic logic into an English (mathematical) sentence
- understand how the order of quantifiers can affect the meaning of a statement involving several variables
- understand how one goes about writing a *direct proof*
- know the definitions of *divisibility of integers*, *even* and *odd* integers, and be able to write proofs or find counter-examples for simple statements involving these concepts

Finally, you should be able to call upon your own prodigious mental faculties to respond in flexible, thoughtful, and creative ways to problems that may seem unfamiliar on first glance. (Humans are awesome — I don't care what Doron Zeilberger says.)

# Part 2: Take-home exam

The take-home portion of Exam 1 will consist of 5 theorems and you will be required to prove any 3 of them. This half of Exam 1 is due on **Monday, March 2** and the beginning of class (no exceptions). These are the simple rules for the take-home portion of the exam:

1. You are NOT allowed to copy someone else's work.
2. You are NOT allowed to let someone else copy your work.
3. You are allowed to discuss the problems with each other and critique each other's work.

If these simple rules are broken, then the remaining exams will be all in-class with no reduction in their difficulty.