Plymouth State UNIVERSITY

MA 3110: Logic, Proof, and Axiomatic Systems

Guidelines for the Final Exam

The Final Exam is cumulative, which means that any material that we have covered this semester is fair game. Questions on material covered on the first three exams (in-class and take-home) will be similar in nature to the questions asked on those exams. In fact, you may see some of the same questions again. You are also responsible for the material covered since the last exam: Sections 4.2 and 4.3. You may bring one **8.5 inch by 11inch cheat sheet** with you to the exam.

Unlike the previous exams, the Final Exam will not have a take-home portion. The entire exam will take place on **Monday, December 15 from 11:00 am – 1:30 pm**. The Final Exam is worth 100 points (roughly 19% of your final grade).

As with the previous exams, you should be prepared to generate examples. On the Final Exam, you will also be required to write some proofs. The proofs that you write on the exam will be worth 30–40 points. As well as writing proofs, you will be asked to describe proof techniques. For example, "describe how you would go about proving a statement of the form $P \implies Q$ by contradiction." A possible answer would look like: "Assume P and $\sim Q$ and then derive a contradiction." Here are some other examples to ponder: How do you go about proving that $A \subseteq B$? How about P iff Q? There are more, but I'll leave it to you to figure out what some other examples might be.

Here is a list of topics from Sections 4.2 and 4.3 that you should know and understand:

- know the definition of the *inverse* of a function and be able to compute one
- know the definition of the *composition* of two functions with compatible domains and codomains and be able to compute one
- know statement of Theorem 4.2
- have an intuitive understanding of Theorems 4.4 and 4.5
- know definition of the *restriction* of a function to a subset of domain and be able to compute one
- know definition of *onto/surjection*
- be able to prove that a given function is or is not onto
- have an intuitive understanding of Theorems 4.7 and 4.8
- know definition of *one-to-one/injection*
- be able to prove that a given function is or is not one-to-one
- know *horizontal line test for one-to-one*
- know statement of Theorem 4.9

- be able to prove whether the inverse of a function is or is not a function
- have an intuitive understanding of Theorem 4.11
- know definition of a *bijection/one-to-one correspondence*
- be able to prove that a given function is or is not a bijection
- have an intuitive understanding of Theorem 4.14
- be able to evaluate the validity of a proposed "proof" of a statement involving relevant definitions
- as well as being able to generate examples, you should be able to construct counterexamples to show that a given statement is false

Additionally, 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. Have any of you looked this guy up?) Finally, you should prepare yourself sufficiently that you can read and understand without undue anxiety.