DISCRETE MATHEMATICS
Math 245

Michael E. O'Sullivan

Suggestions for preparing for the First Exam

I. Know how to use truth tables:

- To show two statements equivalent.
- To prove a statement is a tautology or a contradiction.
- To show that an argument is valid.

II. Know how to translate from English to formal logic.

- Standard "or" versus "exclusive or."
- Variety of ways to express a conditional.
- Variety of ways to express universal and existential statements.
- Know how to negate a statement.

III. Logical arguments:

- Know the basic valid arguments (modus ponens, disjunctive syllogism, universal instantiation). The names are not as important as an ability to use them well.
- Knights and knaves problems.
- Solution of a logic puzzle: 1) Identify the basic predicates, 2) translate the complex statements, 3) derive a conclusion using valid arguments.

IV. Properties of the integers and rational numbers:

- Be able to use (and recognize that you are using) commutativity, associativity, the additive and multiplicative identity, the additive inverse (and, for the rationals, the multiplicative inverse), distributivity.
- Properties of $<$.
- Definitions of prime, composite, divides, floor, ceiling.

V. Know the statements of the following theorems:

- Quotient-remainder theorem.
- For a prime p and integers a and b, if p divides ab then p divides a or p divides b.
- The unique factorization theorem.

VI. Know how to do simple proofs:

- Direct proof, proof by contraposition, division into cases.
- Prove properties of divisibility.
- Prove properties of the ceiling or floor functions.