Review for Exam 1
The exam will cover chapters 1, 2, and 3

1. **Proof techniques**

   a) Direct Proof
   b) Proof by way of contrapositive
   c) Proof by contradiction
   d) Proof using cases

   For each method be able to read a proposition (theorem) and tell what will be assumed and what must be shown.

2. **Logic**

   a) Know the truth tables for $P \to Q$, $P \vee Q$, $P \wedge Q$.
   b) Be able to use truth tables to show logical equivalences.
   c) Be able to write the negations of statements involving "and", "or", "if-then", "for all", "there exists".
   d) Know the logical equivalences given in Theorem 2.9 on page 43. In particular, be able to relate these to the proof techniques.

3. **Number Theory**

   a) Be able to write the exact definitions and give examples of the following terms and phrases:

   "n odd", "n even", "a is congruent to b modulo n", "a divides b", "n is rational", "n is irrational"

   b) Know "Important Theorems and Results about Even and Odd Integers" as well as "Important Theorems and Results about Divisors" given on pages 146 – 147.

   c) Know the Division Algorithm given on page 147 and be able to find q and r given a and b.

   d) Know how to use the Division Algorithm to set up cases in a proof using cases.

   e) Know Theorem 3.31 and its corollary 3.32 on page 136

   f) Know Theorem 3.30 on page 134

You will be asked to write one or two short proofs. They will not require tricks that you have not seen before. They will follow in a straight forward manner if you understand what is given to you and what needs to be shown. You will also need to apply the appropriate definitions correctly. Most of the test will ask shorter questions. For example, you may be asked to write the negation of the statement "3 divides n and 2 divides n". You might also be asked to write down what it is you are allowed to ASSUME when you prove a particular statement using a certain method. For example, if you were to prove the proposition "if n^2 is even then n is even" using the contrapositive what would you ASSUME to begin the proof? Other examples of questions that may be asked include:

1) Give several values of n such that $n \equiv 3 \pmod{5}$.

2) Write the relation $a \equiv 1 \pmod{b}$ as an equivalent statement using "divides".

3) Give a value of r such that $0 \le r \le 12$ and $1000 \equiv r \pmod{13}$