EXAM 1: **NAME:**__________________

1) (4pts) State the triangle inequality.

2) (8pts) Let $S = \{x \in \mathbb{R} : x(x-1)(x-2)(x-3) < 0\}$. Let T be the interval $(0, 1)$ and U be the interval $(2, 3)$. Obtain a simple set equality relating S, T, and U.

3) (7pts) Using membership of sets verify $A - B \subseteq A$ (do not use truth tables.)

4) (9pts) State the three proof techniques we discussed in Chapter 2.

5) (10pts) Negate the following:

   a) There is an $x \in A$ such that, for all $b \in B$, $b > x$.

   b) $(\forall x \in R)(\exists y, m \in R)(x + 2y = m)$

6) (10pts) Restate the following using quantifiers:

   a) For all $x, y \in R$, $f(x) = f(y)$ implies $x = y$.

   b) Every odd number is prime.

7) (8pts) Are the following true or false? (No justification is required.)

   a) If $f + g$ is bounded then f and g are bounded also.

   b) For all $a, x \in R$ there is a unique y such that $x^2y + ay + x = 0$.

8) (16pts) Prove the following using truth tables:

   a) If P and Q are statements, $P \wedge Q \implies Q$.

   b) For sets A and B, $A - B = A - (A \cap B)$.

9) (16pts) Prove that n is odd if and only if n^3 is odd.

10) (12pts) Prove that if f and g are bounded (real-valued) functions then $f + g$ is also bounded.