MATH 215 **Summer 2009** **Radford**

Written Homework #1

Due at the beginning of class 06/19/2009

1. Construct truth tables to determine whether or not the following statements are equivalent, one implies the other, or that they are negations of each other:

   a) (not P) or Q;

   b) P and (not Q).

2. Construct truth tables to determine whether or not the following statements are equivalent, one implies the other, or that they are negations of each other:

   a) not (P or Q);

   b) (not P) or (not Q).

3. Construct truth tables to determine whether or not the following statements are equivalent, one implies the other, or that they are negations of each other:

   a) (P implies Q) implies (not R);

   b) P implies ((not Q) implies R).

4. Consider the following universal statement: If x is a real number and $x \geq 0$ then $x^2 < x$.

   a) Determine whether or not this universal statement is true.

   b) Determine whether or not the converse of this universal statement is true.

Construct tables similar to Table 2.1.2 of the text.

5. Let $a \in \mathbf{R}$, let P be the statement "$a < -1$", and let Q be the statement "$a^2 - 2a - 3 \geq 0$". Which of the following are true? In each case supply a proof or counterexample. For proofs you may assume Axiom 3.1.2 on page 24 of the text.

   a) P implies Q.

   b) Q implies P.

   c) P only if Q.

   d) P is necessary for Q.

   e) P is sufficient for Q.

   f) P if and only if Q.