

Math 215, Fall 05

Homework #1

Due Friday, 09/02/05 at the beginning of class

1. Consider the following statements:

- a) (not P) and (not Q);
- b) not (P and Q);
- c) (not P) or (not Q);
- d) not (P or Q).

Construct the truth table for each and determine which are logically equivalent.

2. Consider the following statements:

- a) (not P) and Q ;
- b) P or (not Q).

Determine, by constructing truth tables or other means:

- a) whether these statements are logically equivalent;
- b) whether they are negations of each other; and
- c) whether or not one implies the other.

3. Determine the logical relationships (equivalence, implication, negation) between the following statements:

- a) (not P) implies Q ;
- b) not (P implies Q);

c) (not Q) implies P .

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 P OR Q denote the “exclusive or” statement. It is defined by the truth table

P	Q	P OR Q
T	T	F
T	F	T
F	T	T
F	F	F

Show that P OR Q is logically equivalent to a statement built from P , Q , “and”, “or”, and “not”. [Hint: Think in terms sets and set operations.]