

ASSIGNMENT 1

ECE 103 (Spring 2009)

Due in tutorial on Monday, May 11.

1. Is the following argument valid? Why or why not?

Engineering students are good at math.

Alice is good at math.

Therefore, Alice is an engineering student.

2. Let P and Q be statements. Find the truth tables for the statements

(a) $\text{NOT}(P \text{ OR } Q)$

(b) $\text{NOT}(P \text{ AND } Q)$

(c) $(\text{NOT } P) \text{ OR } (\text{NOT } Q)$

(d) $(\text{NOT } P) \text{ AND } (\text{NOT } Q)$,

and write two true statements of the form “ R if and only if S ”, where R and S are distinct statements from the above list.

3. The *exclusive or* of statements P and Q , denoted $P \text{ XOR } Q$, is true if precisely one of P and Q is true; it is false if they have the same truth value. Find an expression for $P \text{ XOR } Q$ using only P , Q , AND, OR, and NOT.

4. In this problem, the universe of discourse is \mathbb{Z} , the integers. Determine whether each of the following statements is true or false, and provide an explanation.

(a) $\exists x \exists y, x^2 \geq y$

(b) $\forall x \forall y, x^2 \geq y$

(c) $\exists y \forall x, x^2 \geq y$

(d) $\exists x \forall y, x^2 \geq y$

(e) $\forall y \exists x, x^2 \geq y$

5. Is the statement “If x is a real number, then $x^2 + 5x + 5 \geq 0$ ” true or false? Prove or disprove this statement.