Assignment #1

Due on Wednesday January 27, 2010

Read Handout #1 on *Mathematical Reasoning.*

Read Section 1.3 on *Statements* on pp. 3,4 in Schramm's text.

Read Section 1.4 on *Connectives* on pp. 5–8 in Schramm's text.

Do the following problems

1. Use a Truth Table to establish the following equivalence known as one of De Morgan's laws:
$$\neg(P \wedge Q) \equiv \neg P \vee \neg Q$$

2. Use a Truth Table to establish the following equivalence known as one of De Morgan's laws:
$$\neg(P \vee Q) \equiv \neg P \wedge \neg Q$$

3. Prove the following distributive property
$$P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$$

4. Prove the following distributive property
$$P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$$

5. Establish the following rule of reasoning known as *Modus Ponens:*
$$[(P \Rightarrow Q) \wedge P] \Rightarrow Q$$

6. Establish the following rule of reasoning known as *Modus Tollens:*
$$[(P \Rightarrow Q) \wedge (\neg Q)] \Rightarrow \neg P$$

7. Establish the *Disjunctive Syllogism:*
$$[(P \vee Q) \wedge (\neg Q)] \Rightarrow P$$

8. Write the negation of the statement
$$\forall\ \varepsilon > 0\ \exists\ n \geqslant 1 \text{ such that } \frac{1}{n} < \varepsilon$$

9. Write the negation of the statement
$$\forall\ \varepsilon > 0\ \exists\ a \in A \text{ such that } a < \varepsilon$$

10. Write the negation of the statement
$$\forall\ M\ \exists\ N \geqslant 1 \text{ such that } n \geqslant N \Rightarrow x_n \geqslant M$$