

Assignment #1

Due on Wednesday, September 12, 2012

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 equivalences known as one of De Morgan's laws:

(a) $\neg(P \wedge Q) \equiv \neg P \vee \neg Q$

(b) $\neg(P \vee Q) \equiv \neg P \wedge \neg Q$

2. Prove the following distributive properties

(a) $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$

(b) $P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$

3. Establish the following rule of reasoning known as *Modus Ponens*:

$$[(P \Rightarrow Q) \wedge P] \Rightarrow Q$$

4. Establish the *Disjunctive Syllogism*:

$$[(P \vee Q) \wedge (\neg Q)] \Rightarrow P$$

5. Give the negations of the following statements.

(a) $\forall \varepsilon > 0 \exists n \geq 1$ such that $\frac{1}{n} < \varepsilon$,

(b) $\forall \varepsilon > 0 \exists a \in A$ such that $a < \varepsilon$.