

Math 2283 - Introduction to Logic

Homework #5 - 2006.10.12

Due Date - 2006.10.18

Name: _____

Determine if the following arguments are valid or invalid. Do not use a truth table to determine your answer, instead use the shortcut we have recently discussed. If the argument is valid, state why (be sure to cover all possibilities). If the argument is invalid, state why and also state the conditions on the atomic wff's which make it invalid.

1.

$$((P \wedge R) \Rightarrow Q)$$

$$(Q \Rightarrow R)$$

$$(Q \vee R)$$

$$\therefore (P \Leftrightarrow Q)$$

2.

$$((P \wedge R) \Rightarrow Q)$$

$$(Q \Rightarrow R)$$

$$(Q \vee R)$$

$$\therefore (P \Rightarrow Q)$$

3.

$$((P \vee R) \Rightarrow S)$$

$$((S \wedge R) \Leftrightarrow P)$$

$$(\neg P \Rightarrow (\neg S \vee R))$$

$$\therefore (R \vee S)$$

4.

$$((P \vee R) \Rightarrow S)$$

$$((S \wedge R) \Leftrightarrow P)$$

$$(\neg P \Rightarrow (S \vee R))$$

$$\therefore (R \vee S)$$

5.

$$((R \vee S) \Rightarrow (P \wedge Q))$$

$$((S \wedge R) \Leftrightarrow \neg Q)$$

$$(\neg S \vee (Q \Rightarrow R))$$

$$\therefore ((P \wedge Q) \Rightarrow R)$$

6.

$$((R \vee S) \Rightarrow (P \wedge Q))$$

$$((S \wedge R) \Leftrightarrow \neg Q)$$

$$((P \wedge S) \Leftrightarrow (R \vee Q))$$

$$(\neg S \vee (Q \Rightarrow R))$$

$$\therefore ((P \wedge Q) \Rightarrow R)$$