163 Homework 2 Name: _____

Show that each of the following statements is a tautology

1. $(p \wedge q) \rightarrow (p \rightarrow q)$

p	q	$p \wedge q$	$p \rightarrow q$	$p \wedge q \rightarrow (p \rightarrow q)$
T	T			
T	F			
F	T			
F	F			

2. $\neg(p \rightarrow q) \rightarrow \neg q)$

p	q	$\neg q$	$p \rightarrow q$	$\neg(p \rightarrow q)$	$\neg(p \rightarrow q) \rightarrow \neg q$

3. $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

p	q	r	$p \rightarrow q$	$q \rightarrow r$	$(p \rightarrow q) \wedge (q \rightarrow r)$	$p \rightarrow r$	$(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$

4. Show each of the above is a tautololgy without using truth tables.

5. Show that $p \to q$ and $\neg q \to \neg p$ are logically equivalent.

6. Show that $p \leftrightarrow q$ and $\neg(p \oplus q)$ are logically equivalent.

7. Show that $p \leftrightarrow q$ and $(p \to q) \wedge (q \to p)$ are logically equivalent.

8. Show that $(p \to q) \vee (p \to r)$ and $p \to (q \vee r)$ are logically equivalent.