Math 308 Quiz 3
June 8, 2015

Name: ANSWERS

Instructions: Answer all problems in the space provided.

1. Use a truth table to compare the statements: $P \Rightarrow Q$, $(\sim P) \vee Q$, and $P \wedge (\sim Q)$:

P	Q	$P \Rightarrow Q$	$(\sim P) \vee Q$	$P \wedge (\sim Q)$
T	T	T	T	F
T	F	F	F	T
F	T	T	T	F
F	F	T	T	F

2. What conclusions can you make from the above? Use proper jargon! $P \Rightarrow Q \equiv (\sim P) \vee Q$ and $(\sim P) \vee Q \equiv \sim(P \wedge (\sim Q))$

3. Suppose $\{S_1, S_2\}$ are partitions of a set S and $x \in S$. True (T) or false (F):
   (a) If we know $x \notin S_1$, then x must belong to S_2. T
   (b) It's possible that $x \notin S_1$ and $x \notin S_2$. F
   (c) Either $x \notin S_1$ or $x \notin S_2$. T
   (d) Either $x \in S_1$ or $x \in S_2$. T
   (e) It's possible that $x \in S_1$ and $x \in S_2$. F

4. Modus ponens is an important argument form. It goes, for statements P and Q, $(P \wedge (P \Rightarrow Q)) \Rightarrow Q$. Show that this is a tautology.

P	Q	$P \Rightarrow Q$	$P \wedge (P \Rightarrow Q)$	$(P \wedge (P \Rightarrow Q)) \Rightarrow Q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

→ Tautology!

Bonus problems:

1. Write down the negation of the statements: $\forall x, P(x)$: $\exists x, \sim P(x)$ and $\exists x, Q(x)$: $\forall x, \sim Q(x)$

2. In English, what does $\forall$ translate to? For all, what about $\exists$? There exists / for some

3. Prove: If n is even, then $3n + 4$ is even.

Pf: Assume n is even, then $n = 2k$ for $k \in \mathbb{Z}$. Then we have $3n+4 = 3(2k)+4 = 2(3k+2)$. Since $3k+2 \in \mathbb{Z}$, $3n+4$ is even. ∎