PHIL 103: Logic and Reasoning QRII

Practice #3 Solutions

1. In this exercise, we are comparing $(P \rightarrow Q)$ and $(\sim Q \rightarrow \sim P)$

P	Q	$\sim Q$	$\sim P$	$(\sim Q \rightarrow \sim P)$	$(P \rightarrow Q)$
1	1	0	0	1	1
1	0	1	0	0	0
0	1	0	1	1	1
0	0	1	1	1	1

The sentences are equivalent.

2. $\{ (P \rightarrow Q) \} \vdash (\sim Q \rightarrow \sim P)$.

1	(1)	$(P \rightarrow Q)$	A
2	(2)	$\sim Q$	A (for CP)
2	(3)	$(P \rightarrow \sim Q)$	2 →I
1,2	(4)	$\sim P$	1,3 ~I
1	(5)	$(\sim Q \rightarrow \sim P)$	2,4 CP

3. $\{ (\sim Q \rightarrow \sim P) \} \vdash (P \rightarrow Q)$.

1	(1)	$(\sim Q \rightarrow \sim P)$	A
2	(2)	P	A (for CP)
3	(3)	$\sim Q$	A*
1,3	(4)	$\sim P$	1,3 →E
1	(5)	$(\sim Q \rightarrow \sim P)$	3,4 CP
2	(6)	$(\sim Q \rightarrow P)$	2 →I
1,2	(7)	$\sim\sim Q$	5,6 ~I
1,2	(8)	Q	7 ~E
1	(9)	$(P \rightarrow Q)$	2,8 CP

4. Give the contrapositive:

   a. If Terrence [doesn’t not] knows the answer, then Karen doesn’t know the answer.
   b. If Gary [doesn’t not] brings dip to the party, then Lou [doesn’t not] brings chips.
   c. If there is no thunder, then there is no lightning.
      There is no thunder only if there is no lightning.
   d. If the textbook is [not not] clear enough, then students do not complain.
      The textbook is [not not] clear enough only if the students do not complain.

5. Kermit sings, and Miss Piggy loves Kermit.

6. Let k = Kermit, p = Miss Piggy, H = “… is happy,” and S = “… is singing.” Then, we have:

$(Hk \vee Sp)$

7. Let f = Fozzie, s = Statler, and w = Waldorf. Let J = “… tells a joke,” and let H = “… heckles ---.” Then, we have:

$(Jf \rightarrow (Hsf \wedge Hwf))$

8. Every experiment conducted by Dr. Bunsen Honeydew injures Beaker.

9. Let G = “… is green,” let M = “… is a Muppet,” let S = “… sings,” and let P = “… plays the banjo.” Then, we have:

$(\exists x)((Gx \wedge Mx) \wedge (Sx \wedge Px))$

10. Examples of relations could be lots of things. Here are a few:

a. Symmetric:
H = “… is exactly as healthy as ---”
S = “… is shaking hands with ---”
C = “… is in the same class as ---”

b. Asymmetric
G = “… is gentler than ---”
K = “… climbs faster than ---”

c. Transitive
O = “… is older than ---”
U = “… contains ---”
I = “… is identical with ---”