PHIL 103: Logic and Reasoning QRII

Practice #3

An important and interesting fact about the material conditional is that $(P \rightarrow Q)$ is equivalent to $(\sim Q \rightarrow \sim P)$. These two sentence types are related by *contraposition*. The second sentence is the *contrapositive* of the first sentence, and vice versa. The next four questions have to do with contraposition.

1. Use truth tables to show that a material conditional is equivalent to its contrapositive.

2. Show the following: $\{ (P \rightarrow Q) \} \vdash (\sim Q \rightarrow \sim P)$.

3. Show the following: $\{ (\sim Q \rightarrow \sim P) \} \vdash (P \rightarrow Q)$.

4. Given a sentence in English, state the contrapositive of the sentence. For example, if you were given the sentence, "If Sally runs every day, then she is in good shape," then you would answer, "If Sally isn't in good shape, then Sally doesn't run every day."

   a. If Karen knows the answer, then Terrence doesn't know the answer.
   b. If Lou does not bring chips to the party, then Gary does not bring dip.
   c. There is lightning only if there is thunder.
   d. Students complain only if the textbook is not clear enough.

5. Let k stand for Kermit, and let p stand for Miss Piggy. Furthermore, let L stand for the relation "… loves ---," and let S stand for the predicate "… is singing." Translate the following sentence from our formal language into English: (Sk ∧ Lpk).

6. Translate the following sentence into our first-order language: Kermit is happy unless Miss Piggy is singing.

7. Translate the following sentence into our first-order language: If Fozzie tells a joke, then Statler and Waldorf heckle him.

8. Let b stand for Beaker, and let h stand for Dr. Bunsen Honeydew. Moreover, let E stand for the predicate "… is an experiment," let B stand for the relation "… is conducted by ---," and let I stand for the relation "… injures ---." Translate the following sentence from our formal language into English: (∀x)((Ex ∧ Bxh) → Ixb).

9. Translate the following sentence into our first-order language: Some green Muppets sing and play the banjo.

10. Give an example of each of the following kinds of relation, and explain why your example instantiates the kind. Do not use examples given in the textbook.

        a. Symmetric
        b. Asymmetric
        c. Transitive