Problems to Week 2 Tutorial — MACM101 (Fall 2014)

1. State the converse, contrapositive, and inverse of each of these implications:

   - If it snows today, I will ski tomorrow.
   - I come to class whenever there is going to be a quiz.
   - A positive integer is a prime only if it has no divisors other than 1 and itself.

2. Express these system specifications using propositional logic, construct the truth table for the compound statement:

   "Access is granted whenever the user has paid the subscription fee and enters a valid password."

3. Are these system specifications consistent:

   "The system is in multiuser state if and only if it is operating normally. If system is operating normally, the kernel of is functioning. The kernel is not functioning or the system is in interrupt mode. If the system is not in multiuser state, then it is in interrupt mode. The system is not in interrupt mode."

4. Construct the truth tables for the following formulas:

   - $(p \to q) \to (q \to p)$,
   - $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow q)$, (*)[1]
   - $(p \to q) \wedge (\neg p \to q)$. (*)

5. There are two tribes living on the island of Knights and Knaves: knights and knaves. Knights always tell truth and knaves always lie. You encounter two people A and B. What are A and B if A says, "B is a knight", and B says, "The two of us are opposite types"?

6. There are two tribes living on the island of Knights and Knaves: knights and knaves. Knights always tell truth and knaves always lie. You encounter two people A and B. What are A and B if A says, "The two of us are both knights"', and B says, "A is a knave"? (*)

[1] A 'bonus' problem.