Supplementary Logic Exercises

1. Which of the following are statements?
   A) Lemons and oranges are citrus fruits.
   B) Do you like mathematics?
   C) Apples are citrus fruits.
   D) Walk a mile.
   E) What a day!
   F) The moon is made of green cheese.

2. Construct a truth table for each of the following statements:
   A) \((p \land q) \Rightarrow (\neg p \land \neg q)\)  
   B) \((p \land q) \Rightarrow r\)  
   C) \(p \Rightarrow (q \Rightarrow r)\)  
   D) \((\neg q \land p) \lor r\)

3. Are any of the statements in question 2 tautologies? Explain.

4. Write the negation of each of the statements:
   A) Some cows are spotted.
   B) The room is too warm or the room is too dark.
   C) The room is too warm and the room is too dark.
   D) All poets are logical.
   E) Some poets are mathematicians.

5. Write (in English) the inverse, converse and contrapositive of each of the following:
   A) If I don’t go to the movie, I’ll study my math.
   B) If rain is wet and pigs can fly, then the moon is round.

6. Use the method of contradiction to determine whether each of the following arguments is valid or not valid.
   A) \(p \Rightarrow q\)
   \(q \Rightarrow r\)
   \(-s \Rightarrow -r\)
   B) \(p \land q\)
   \(-p \lor r\)
   \(-r\)
   \(\therefore \neg q\)

7. Consider each of the arguments in question 6 that were valid. Prove the validity of each
of them by using the Basic Rules of Inference.

8. Assign letters to the simple statements and symbolize the following arguments:
A) If you arrive on time, you’ll get a good seat.
   If you get a good seat, you’ll enjoy the play.
   ∴ If you didn’t enjoy the play you didn’t arrive on time.
B) If the room is too warm or it is too dark, then I will not be comfortable.
   The room is not too dark.
   If the window is open, then the room is not too warm.
   ∴ If the window is open, then I will be comfortable.

9. Draw diagrams to determine which of the following arguments are valid:
A) All rock stars have green hair.
   No presidents of banks are rock stars.
   ∴ No presidents of banks have green hair.
B) All philosophers are intelligent.
   Sigmund Freud was intelligent.
   ∴ Sigmund Freud was a philosopher.
C) No candy is good for you.
   Yogurt is good for you.
   ∴ Yogurt is not candy.
D) All foreign cars are expensive.
   My car is expensive.
   ∴ My car is a foreign car.
E) All actors are handsome.
   Some actors are tall.
   ∴ Some handsome people are tall.
F) Some athletes are hippies.
   All hippies have long hair.
   ∴ All athletes have long hair.
G) Some athletes are hippies.
   All hippies have long hair.
   ∴ Some athletes have long hair.