Name _____

Points (20) _____

Intermediate Logic

Homework #18

(Due: 2/19/2013)

Read pages 47-56 in the *Intermediate Logic* text and complete the exercises.

Define the following logical operator as explained in the text.

- Biconditional –

Exercise 10 (page 49)

Set up the biconditional for each pair of propositions to determine if they are logically equivalent, contradictory, or neither. In this exercise, do not use guide columns. Rather, place the truth values immediately beneath the variables and work outward.

1. ~ (p v q) ≡ ~p v ~q

   _____

   _____

   _____

   _____

   Relationship: _____

2. p ⊃ q ≡ ~q ⊃ ~p

   _____

   _____

   _____

   _____

   Relationship: _____

3. ~ (~p v q) ≡ p ⊃ q

   _____

   _____

   _____

   _____

   Relationship: _____

4. p ⊃ (q ⊃ r) ≡ (p ⊃ q) ⊃ r

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   Relationship: _____

5. Write a set of propositions in English which could be symbolized by problem #2.

_____

_____

Exercise 11 (page 54)

Determine the truth value for each compound proposition. Assume that propositions A and B are true, X and Y are false, and P and Q are unknown. Circle **T** if the proposition is true, circle **F** if it is false, and circle **?** if the truth value cannot be determined. (Hint: There are two of each.) Space is provided to do tables under the propositions if needed.

1. $P \vee \sim P$ T F ?

2. $(P \supset P) \supset X$ T F ?

3. $(Y \supset P) \supset Q$ T F ?

4. $P \supset (X \vee Y)$ T F ?

5. $\sim Q \bullet [(P \vee Q) \bullet \sim P]$ T F ?

6. $\sim[P \vee (B \bullet Y)] \vee [(P \vee B) \bullet (P \vee Y)]$ T F ?

Use truth tables to determine the validity of the following arguments. (Use arrows and indicate whether the argument is valid or invalid.)

7. $p \quad v \quad q \quad \sim p \quad \therefore q$

8. $p \quad \supset \quad q \quad \therefore p \supset (p \bullet q)$

9. $p \quad \bullet \quad q \quad \therefore p \vee q$

10. $p \supset \sim q \quad \sim q \quad \therefore p$

11. If Jesus was John the Baptist raised from the dead, then He could do miracles. Jesus did miracles, so He was John the Baptist raised from the dead. (**J** means *Jesus was John the Baptist raised from the dead*, **M** means *He could do miracles*.)

12. If Jeff studies then he will get good grades. If Jeff does not study then he will play. So Jeff will either get good grades or he will play. (**S** means *Jeff studies*, **G** means *He will get good grades*, and **P** means *He will play*.)

13. If Jesus is not God then He was a liar or He was insane. Jesus was clearly not a liar. He certainly was not insane. We must conclude that Jesus is God. (**G** means *Jesus is God*, **L** means *He was a liar*, and **I** means *He was insane*.)

14. If taxes increase then the public will complain, but if the deficit increases then the public will complain. Either taxes or the deficit will increase. Thus the public is bound to complain. (**T** means *Taxes increase*, **P** means *The public will complain*, and **D** means *The deficit increases*.)

Exercise 12 (page 56)

Use truth tables to determine the validity of the propositional arguments below.

1. $p \quad \therefore \sim p \ \vee \ q$

2. $p \supset q \quad \therefore \sim q \supset \sim p$

3. $p \supset q \quad \sim q \quad \therefore p \equiv q$

4. $p \supset (q \supset r) \quad q \quad \therefore r \supset p$

5. $p \supset (\sim q \supset r) \quad p \quad \therefore \sim r \supset q$

6. $(p \supset q) \bullet [(p \bullet q) \supset r] \quad p \supset (r \supset s) \quad \therefore p \supset s$

Cranium Calisthenics

The Lady or the Tiger?* (The Fourth Trial) "Yesterday was a fiasco," said the king to his minister. "All three prisoners solved their puzzles! Well, we have five trials coming up today, and I think I'll make them a little tougher."

"Excellent idea!" said the minister.

Well, in each of the trials of this day, the king explained that in the left-hand room (Room I), if a lady is in it, then the sign on the door is true, but if a tiger is in it, the sign is false. In the right-hand room (Room II), the situation is the opposite: a lady in the room means the sign on the door is false, and a tiger in the room means the sign is true. Again, it is possible that both rooms contain ladies or both rooms contain tigers, or that one room contains a lady and the other a tiger. After the king explained the above rules to the prisoner, he pointed to the signs.

Which room should the prisoner pick, and why? (You must explain your answer in order to get credit!)

I
BOTH ROOMS CONTAIN LADIES

II
BOTH ROOMS CONTAIN LADIES

* *The Lady or the Tiger? And Other Logic Puzzles*, by Raymond Smllyan. Random House, Inc. 1982.