Unit 3 Part 1: Boolean Logic and Logic Gates STUDY GUIDE

1. Define, write the mathematical notation, and give an example of each of the following.

Logically Equivalent:

Tautology:

Inverse:

Converse:

Contrapositive:

2. Fill in the following truth table.

p	q	$p \land q$	$q \rightarrow p$	$\sim (q \rightarrow p)$	$(p \land q) \nleftrightarrow (q \rightarrow p)$

3. Construct a truth table for  $(p \nleftrightarrow q) \lor (p \multimap (\sim q))$ 

4. State the eight logical equivalences presented in class.

5. Draw a logic gate diagram for  $\sim ((\sim p \lor q) \land (p \lor \sim q))$ .

6. Rewrite the statement to eliminate the use of the biconditional and then draw a circuit diagram for  $(p \lor q) \Leftrightarrow \sim p$ .

7. Simplify  $\sim (\sim q \rightarrow (\sim p))$  using logical equivalences and then draw a logic gate diagram of the simplified statement.

Simplified statement:

Logic Gate Diagram:

8. Write a logic statement for the following logic gate diagram.



9. Use this logic gate diagram to answer the following questions.



- a. Write the logic statement the gate diagram represents.
- b. Create a truth table for the statement.

- c. Find a simpler statement that is logically equivalent to the statement in part a.
- d. Draw a logic gate diagram of the statement in part c.