

1. Which of the following are propositions.
  - a. My feet are too big.
  - b. Your feet are too big.
  - c. What time is it?
  - d. It's time for dinner!
  - c. Well then, bring me a steak!
  - d. Mimsy were the borgroves.
  - e. I like movies.
  - f. Of time and a river.
  - g. Some say the world will end in fire.
  
2. Give truth tables for the following.
  - a.  $p \vee q$
  - b.  $p \vee (q \wedge r)$
  - c.  $(p \wedge q) \vee (p \wedge r)$
  
3. Which of the following are true?
  - a. If cows are green then pigs can fly.
  - b. If  $x > 7$  then  $x + 5 > 12$
  - c. If 3 is a prime number then 10 is odd.
  - d. If I won the lottery then I will go to Paris.
  - e. If 9 is a prime number then 10 is bigger than 100.
  
4. Use truth tables to determine which are true and which are false.
  - a.  $(p \rightarrow q) \wedge (q \rightarrow r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$
  - b.  $(p \wedge q) \rightarrow r \equiv (p \rightarrow q) \wedge (p \rightarrow r)$
  - c.  $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$
  
5. Is the following inference rule correct or incorrect?
 
$$\frac{p \wedge q \quad r}{p \vee q \vee r}$$
  
6. Given  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ ,  $A = \{1, 2, 3\}$ ,  $B = \{4, 5, 6\}$ ,  $C = \{6, 7, 8\}$  give the following.
  - a.  $A \cap B$
  - b.  $A \cup B$
  - c.  $B \cap C$
  - d.  $\overline{A}$
  - e.  $B - C$
  
7. State and prove De Morgan's laws for sets.
  
8. Give the commutative, associative, and distributive laws for Boolean Algebra.

9. Give the identity and complement laws for Boolean Algebra.
10. What is an equivalence relation?
11. What is a partial order?
12. What is a function?
13. Negate
  - a.  $(\forall x)x > 7$
  - b.  $(\forall x)x < x + 1$
  - c.  $(\exists x)x < 3 \wedge x > 7$
14. Give the commutative, associative, and distributive laws for integers.
15. Give the identity and inverse and cancellation laws for integers.
17. Prove that  $x^2 + 2x + 1 = (x + 1)^2$