Test 1 – Math 226

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1. (4p) Translate the following statements into English:

Assume p: The dog ate a chicken.

q: The dog was hungry.

1. 
2. 
3. (8p) Consider the conditional statement:

“I will give you candy only if you do your homework quickly.”

1. Write the statement in the form “if p, then q”.
2. Write the contrapositive of the statement in English.
3. Write the converse of the statement in English.
4. Write the inverse of the statement in English.
5. (10p)Use one or two truth tables to decide if and are logically equivalent.
6. (8p) Use equivalence laws to show that is a tautology. FOR EACH STEP, GIVE THE NAME OF THE LAW YOU HAVE USED.
7. (12p) Use predicates and quantifiers to write the following statements is symbolic form. Make sure to clearly define all predicates and their domains.
8. All Math majors love Math.
9. All dogs love one chicken.
10. At least one dog loves all chickens.
11. At least one English major loves Math.
12. (4p) Use quantifiers to negate the statements. No need to translate to symbolic form. Give the English statement.
13. All chickens like to scratch.
14. There is one dog who loves chickens.
15. (4p) Give the truth value of the statement where where the domain of x and y consists of all real numbers.
16. (4p) Translate the statement into English where the domain of each variable is all real numbers .

9. (4p) Determine the cardinality of each the following sets:

a)  \_\_\_\_\_

b)  \_\_\_\_\_

10. (4p) Give the power set of .

11. (6p) Let 

Determine 

12. (6p) Use the **Boolean Diagram Logic Gates** to draw 

13. (8p) Given the following table of values for Boolean functions F and G:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | y | z | F(x,y,z) | G(x,y,z) |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 1 |

Give possible expressions for (please write **neatly**):

a) F(x, y, z) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) F(x, y, z)  G(x, y, z) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) F(x, y, z) + G(x, y, z) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. (4p) Show that  is .

That is – determine k and C such that 

15. (5p) Give the sum-product expansion of . Show clearly the steps you have used. You do not need to quote the properties used.

16. (6p) Show that is a bijection.

17. (2p) Show that is not injective.