CSIT 504 Midterm Exam 1

1. (15 pts) Use Truth Table to determine whether $(p \to q) \wedge (\neg p \to q) \equiv q$

2. (15 pts) Suppose that Q(x) is "x+1=2x", where x is a real number. Find the truth value of the following statement:
   a) Q(2)
   b) $\forall Q(x)$
   c) $\exists Q(x)$
3. (10 pts) What is the power set of the set $\{3, 6\}$

4. (10 pts) Express the negations of each of these statements so that all negation symbols immediately precede predicates
   a) $\forall x \exists y \exists z$ P(x,y,z)
   b) $\exists x \forall y\, P(x, y) \wedge Q(x, y)$

5. (15 pts) Universal set U= $\{x \in Z^+ | x \leq 10\}$, where Z^+indicates positive integers. A= {1, 2, 3}, B= {2, 3, 7}, what are
   a) $A \cap B$
   b) $A \cup B$
   c) A – B
   d) $\bar{A}$

6. (10 pts) According to De Morgan's laws, $\overline{A \cup (B \cap C)}$=? (The answer should be a form without complement symbol appears on the top of $\cap$ and $\cup$)

7. (15 pts) Let f be the function from {a,b,c,d} to {1,2,3} defined by f(a)=2, f(b)=2, f(c)=1, f(d)=3.
   a) Is f an onto function? Please explain the reason.
   b) Is f an one-to-one function? Please explain the reason.

8. (10 pts) Suppose $f: R \to R$, where f(x)=$\lfloor (3x - 1)/2 \rfloor$. Please use interval notation to indicate the value range of x which makes f(x)=1.