CSCE 625
Assignment #6
due: Tues, Nov 23 (by start of class)

1. Translate the following sentences into First-Order Logic

- Tomatos are either a fruit or vegetable.

- Every king has a crown and some subjects.

- An isosceles triangle is a triangle with 2 equals sides (but not 3).

- Some mushrooms are poisonous.

- Someone from the post-office is at the front door of John's house.

- All laptops sold by Dell in 2012 have at least 4 gigabytes of memory.

2. Following the procedure on pages 345-347 in the textbook (Sec. 9.5), convert the following sentences to CNF:

- $\forall$ b1,b2,c1,c2 contains(b1,c1) $\wedge$ contains(b2,c2) $\wedge$ b1≠b2 → c1≠c2   (from Sammy's Sport Shop: "different boxes have different colors")

- $\forall$c country(c)$\wedge$ [$\exists$x (tank(x) $\vee$ missle(x)) $\wedge$ owns(c,x)] → militarized(c)

- $\forall$x P(x)→ [$\forall$y P(y)→P(f(x,y))] $\wedge$ [¬$\forall$y Q(x,y)→P(y)]

3. Determine whether or not the following pairs of predicates are unifiable. If they are, give the most-general unifier and show the result of applying the substitution to each predicate. If they are not unifiable, indicate why. <u>Terms that are variables are in capital letters</u>; constants and function names are lowercase.

a)	P(a, X, f(g(Y)))	P(Z, f(Z), f(U))
b)	Q(f(a), g(X))	Q(Y, Y)
c)	R(f(Y), Y,X)	R(Z, f(a), f(V))
d)	P(a, Y, f(X))	P(Z, f(b), f(b))
e)	Q(g(f(a)), g(X), Z)	Q(Y, Y, f(W))
f)	P(x,f(X),X)	P(Y,f(a),b)
g)	Q(f(a,a), V ,Z)	Q(X, f(X,X), Y)

4. Consider the following situation: *Marcus is a Pompeian. All Pompeians are Romans. Ceasar is a ruler. All Romans are either loyal to Caesar or hate Caesar (but not both). Everyone is loyal to someone. People only try to assassinate rulers they are not loyal to. Marcus tries to assassinate Caesar.*

      a) Translate these sentences to First-Order Logic.

      b) Prove that **Marcus hates Caesar** using <u>Natural Deduction</u>. Label all derived sentences with prior sentences and unifier used.

5. Represent the following information in FOL using Event Calculus and Interval Logic:

- A plant can only produce seeds after it has been polinated.

- The marching band of the home team plays during the halftime of all football games.

- In any football game, if the score is tied at the end of the fourth quarter, there will be overtime.

<u>What to Turn In:</u>
- Please type up your answers and turn in a print out in class on the due date.
- You do not need to turn this assignment in via Turnin on CSNet.