CS6374
Theorem Proving: Assignment

1. Find Skölem standard form for the following formulas:

a. $\sim ((\forall X)P(X) \Longrightarrow (\exists Y)(\forall Z)Q(Y,Z))$.

b. $(\forall X)((\sim E(X,0) \Longrightarrow ((\exists Y)(E(Y,g(X))\wedge(\forall Z)(E(Z,g(X)) \Longrightarrow E(Y,Z))))))$.

c. $\sim ((\forall X)P(X) \Longrightarrow (\exists Y)P(Y))$.

2. Determine if each of the following sets is unifiable. If yes, obtain the *mgu*.

a. $W = \{Q(a, X, f(X)),\ Q(a, Y, Y)\}$

b. $W = \{Q(X, Y, Z),\ Q(U, h(V, V), U)\}$

c. $W = \{P(X, f(X), f(f(X))),\ P(g(Y), f(Y), f(f(g(Y))))\}$

3. Derive the empty clause using resolution from the following clauses: (x denotes variables, a and b are constants and f and g are function symbols).

1. P(x) ∨ P(g(x)) ∨ ¬Q(g(x))
2. ¬P(f(x)) ∨ P(f(g(x)))
3. Q(x)
4. ¬P(f(x)) ∨¬Q(g(a))
5. ¬Q(g(f(a))) ∨¬R(f(f(b)))
6. ¬P(g(x)) ∨¬Q(f(a))
7. Q(f(g(a))) ∨¬R(g(g(b)))

4. Prove the group theory theorem discussed in class from the 4 axioms given. (EX 4.3 pg 50 of Chang and Lee book).