CS 475 — Artificial Intelligence, Fall 1998

Assignment 2

Due Tuesday 27 October

1. Trace through the unification algorithm on your own for the following pairs of literals. **There is nothing to hand in for this question. Just use it to confirm that you understand the algorithm.**
   (a) $f(X)$ and $f(Y)$
   (b) $f(spot)$ and $f(fluffy)$
   (c) $w(fatherOf(A))$ and $w(B)$
   (d) $z(spot, c(Y, X))$ and $z(X, c(fluffy, spot))$

2. For each of the following sets of literals, if they do not unify, explain why they don't unify.
   (a) $\{r(f(Y, f(Y, a)), a), r(f(X, X), a)\}$
   (b) $\{r(f(a), X), r(X, a)\}$
   (c) $\{b(a), r(X)\}$

3. Unify the following pairs of literals. Specifically, if they unify, give the resulting substitutions. Otherwise, state that they do not unify.
   (a)
   $$p(X, f(X), Z)$$
   $$p(g(Y), f(g(B)), Y)$$
   (b)
   $$p(X, f(X))$$
   $$p(f(Y), Y)$$
   (c)
   $$p(X, f(Z))$$
   $$p(f(Y), Y)$$

4. We might represent the sentence "Every investor bought [something that is] is either a stock or a bond" in logic as follows:

$$forall(X)(investor(X) \rightarrow \exists(Y)((stock(Y) \vee bond(Y)) \wedge buy(X, Y)))$$

Translate this sentence into clausal form.

5. Consider the following sentences.

   - Every child loves Santa.
   - Everyone who loves Santa loves any reindeer.
   - Rudolph is a reindeer, and Rudolph has a red nose.
   - Anything which has a red nose is weird or is a clown.
   - No reindeer is a clown.
   - Scrooge does not love anything which is weird.

   Translate these English sentences into predicate-calculus sentences. Then, convert the logical representations into clausal form. Finally, prove that scrooge is not a child, using resolution. (Note: "has a red nose" can be a single predicate. Hint: remember to negate the thing you are trying to prove.)

6. Consider the following sentences.

   - Every LasCrucen who is not conservative loves some roadrunner.
   - Anyone who wears maroon shirts is an Aggie.
   - Every Aggie loves every dog.
   - Nobody who loves every dog loves any roadrunner.
   - Diego is a LasCrucen and Diego wears maroon shirts.

   Translate these English sentences into predicate-calculus sentences. Then, convert the logical representations into clausal form. Finally, resolution to answer, is there a conservative LasCrucen? Use question answering to determine who the conservative LasCrucen is, if there is one.