CSE 4/563 Knowledge Representation
Professor Shapiro
Homework 6
Maximum Points: 13
Due: 1:30 PM, Thursday, October 22, 2009

Name(s)⟨user name(s)⟩: _____

October 15, 2009

You must turn in the answers to this homework set in a submitted file by 1:30 PM on the date shown above.

The submitted file must be named hw6.*ext*, for an appropriate value of *ext*. **Include your name(s) and user name(s) at the top of the file.** Submit that file by executing the Unix command

`submit_cse463 hw6.`*`ext`*

or

`submit_cse563 hw6.`*`ext`*

whichever is appropriate for you. The file can be a text file, or produced by some word processing software, but it must be formatted so it is easy to read.

This homework uses CLIF notation. Notice that:

- The functional term $f(a)$ in CLIF is `(f a)`.
- The atomic formula $P(a)$ in CLIF is `(P a)`.
- The negative literal $\neg P(a)$ in CLIF is `(not (P a))`.
- The wff $\forall x \exists y (P(x) \Leftrightarrow Q(y))$ in CLIF is `(forall x (exists y (iff (P x) (Q y))))`.
- The wff $\forall x \forall y (P(x) \Leftrightarrow Q(y))$ in CLIF is `(forall (x y) (iff (P x) (Q y)))`.
- The wff $P(a) \wedge P(b) \wedge Q(c)$ in CLIF is `(and (P a) (P b) (Q c))`
- The two-literal clause $\{P(x), \neg Q(y)\}$ in CLIF is `((P x) (not (Q y)))`.

1. (10) Translate `(forall x (iff (P x) (exists y (and (Q y) (R x y)))))` into clause form. Show all your steps, but don't bother showing a step where nothing changes.

2. (3) Use resolution refutation to prove that
   `(forall (x y) (iff (Drives x y) (and (Driver x) (Passenger y)))),`
   `(forall x (Drives (motherOf x) x)),`
   `(Passenger Tom)`
   $\models$ `(exists x (Driver (motherOf x)))`