

# Homework 4

CS 5233 – Fall 2007  
Tom Bylander, Instructor

assigned September 19, 2007  
due October 1, 2007

1. (25 pts.) Show how the resolution inference rule and the unit resolution inference rule can be used to infer  $\neg CS3733$  from:

$\neg CS1723$   
 $CS2413 \rightarrow CS2213$   
 $CS2733 \rightarrow CS1723 \wedge CS2513$   
 $CS3233 \rightarrow CS1723$   
 $CS3733 \rightarrow CS2413 \wedge CS2733 \wedge CS3233$

2. (25 pts.) Show how Prover9 can be used to infer that there is a pit in square [3, 1] based on the knowledge base described on p. 208 ( $R_1$  through  $R_5$ ) and on p. 213 ( $R_{11}$  and  $R_{12}$ ). Hand in your input file, the proof produced by Prover9, and a brief explanation of each step in the proof.
3. (25 pts.) Prove  $\neg taken(CS3733)$  using the resolution inference rule for first-order predicate logic.

$\neg taken(CS1723)$   
 $\forall x, y ((taken(y) \wedge prereq(x, y)) \rightarrow taken(x))$   
 $prereq(CS2213, CS2413)$   
 $prereq(CS1723, CS2734)$   
 $prereq(CS2413, CS2734)$   
 $prereq(CS1723, CS3233)$   
 $prereq(CS2413, CS3733)$   
 $prereq(CS2734, CS3733)$   
 $prereq(CS3233, CS3733)$

4. (25 pts.) Show how Prover9 can be used to infer  $uncle(Andy, Billy)$  by extending the ancestor example from the Prover9 handout, plus  $mother(Liz, Andy)$ ,  $male(Andy)$ , and sentences that represent the knowledge that your parent's brother is your uncle. Hand in your input file, the proof produced by Prover9, and a brief explanation of each step in the proof.