ASSIGNMENT 5:
Assigned: 04/14/16 Due: Friday 4/22/16 at 11:55 PM (submit via moodle) Submit only pdf or txt files (in a zip if you have multiple files)

Written/drawn:

Problem 1. (20 points)
Consider the following English description:
There is a land with both trolls and humans. Troll are very large and noisy creatures. Some of these trolls are aggressive and scare humans. Creatures that are larger than humans and aggressive are dangerous. Thankfully, expert hunters track and trap dangerous creatures for a price. Devin is an expert hunter and learns of someone who is willing to pay for a troll to be tracked and trapped.

[10 points] (1) Write the facts paragraph above using first order logic.

[10 points] (2) Use backward chaining to deduce whether or not “Devin will track and trap some troll”. You must show your tree that you generate during the search

Problem 2. (20 points)
Consider the following problem from Homework #4:

KB is...
forall x: Youtube(x) → Free(x) ∧ (Dog(x) v Cat(x))
Youtube(SuperSecret)
forall x: Cat(x) → Loss(x)
forall x: Dog(x) → Loss(x)

[5 points] (1) Convert this into CNF form while remaining in first-order logic.

[10 points] (2) Use resolution to try and answer: KB entails Loss(SuperSecret)

[5 points] (3) Is is possible to add more to the KB that would change your answer to part (2)? Explain why or why not clearly.

Problem 3. (15 points)
Consider a planning problem where you start your dorm with your pen. Today you must take a test in csci4511.

[5 points] (1) Formulate this problem as a planning problem with at minimum 5 actions. Clearly state the goal and initial state using your problem description.

[5 points] (2) Reformulate the problem with 2 to 4 actions, and only using a subset of the relations/literals you did in part (1). (i.e. you cannot add new relations.)

[5 points] (3) Give a general procedure for combining two actions together (you do not need to generalize to any number of actions). [Hint: you need to account for non-trivial preconditions and effects, so it might be instructive to “combine” two unrelated tasks as well]
Problem 4. (15 points)
Consider the following planning problem:

Action( Make(x),
Precondition:
Effect: Have(x))

Action( Eat(x),
Precondition: Have(x),
Effect: ∼Have(x) ^ Full(x))

Initial state: ∼Have(Sandwich) ^ ∼Full(Sandwich)
Goal: Have(Sandwich) ^ Full(Sandwich)

[10 points] (1) Solve this problem using forward chaining search. Show the full tree.

[5 points] (2) Create a relaxation of the planning problem and give a heuristic. Then show the value of this heuristic on every state in your tree from part (1). (Note: you do not need to use this heuristic in a search, simply provide it.)

Problem 5. (30 points)
Consider the same planning problem from Problem 4 on this homework (above).

[15 points] (1) Create the graph-plan until it converges. Show clearly all mutexes.

[5 points] (2) At what level, if any, is our goal possible? Explain why. Is the goal actually achievable at this level? Explain why again.

[10 points] (3) Give an example problem of when graph-plan will have no mutex between two relations/literals upon convergence, yet that pair of relations is impossible to satisfy simultaneously. You do not need to provide the full graph-plan, but you do need to support your answer.