EECS 391: Introduction to AI (Spring 2015) Written Homework 1 (Max Points: 100)

Assigned Tuesday January 20, due midnight Thursday January 29. Write your answers neatly and remember to show all relevant work. Before turning in your work, staple your answer sheets together and write your name and Case ID on the front page. If a pair of you did this assignment together, both your names and IDs should appear on the front page. You may only turn in an assignment as a pair if both of you have contributed equally to it.

1. Research one application of AI from slide 23 of lecture 1 or from other applications you know about and write a high level summary about methods used to solve it. Cite any papers or articles you used to research the application. (10 points)

2. There are known classes of problems that are intractable for computers, and others that are undecidable. Does this mean AI is impossible? (5 points)

3. Support or refute with arguments: "Computers cannot be intelligent because they only do what their programmers tell them." (5 points)

4. Develop a PEAS description for the tasks: (i) Ping-pong playing agent, (ii) Mathematician's theorem-proving assistant. (10 points)

5. Consider a discrete fully observable world with S states. How many distinct simple reflex agents, each with A actions, can be written for such a world? Two agents are distinct if there exists some world state where they take different actions. (10 points)

6. Describe a state space in which iterative deepening is much worse than depth first search. (10 points)

7. Prove that uniform cost search is optimal, i.e. it always finds the lowest cost solution if a solution exists. (10 points)

8. Prove that every consistent heuristic is also admissible. (10 points)

9. Gradient ascent search is prone to local optima just like hill climbing. Describe how you might adapt simulated annealing to gradient ascent search to reduce this problem. (15 points)

10. Derive a condition on the class of functions f for which the Newton-Raphson method guarantees improvement at each step, i.e., each iteration of Newton-Raphson strictly decreases the function value. (15 points)