Grad. Comp. Exam: Artificial Intelligence (Fall 2012)   Student ID: _____

Answer all questions on the exam. You may use the back for additional space. Total: 100 points. Good Luck.

1. (25 pts) On reasoning:

   (a) Discuss Forward Chaining and illustrate with an example.

   (b) Discuss Backward Chaining and illustrate with an example.

   (c) During the inference with Resolution, we would like to reach an empty clause. Explain the significance of reaching an empty clause.

2. (25 pts) On search:

(a) List the sequence of nodes that are visited by Iterative Deepening Search for this search tree (only E and H pass the goal test):

```
              A
            /   \
          B       C
         / \     / \
        D   E   F   H
```
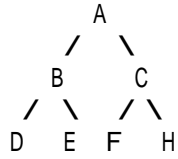
(b) Iterative Deepening Search uses search algorithm *A* to emulate search algorithm *B*. What are *A* and *B*?

(c) Explain the advantage of using Iterative Deepening Search over algorithm *B*.

(d) Explain why Uniform Cost Search can be considered as a special case of A*.

3. (25 pts) On Constraint Satisfaction Problems (CSP):

(a) Name and describe the elements of a CSP

(b) Model the following problem as a CSP: "Four classes can be scheduled in two rooms. Each room is available for two slots a day. Each class has to be scheduled for two slots in a week, each slot in a different day."

(c) What is the relation between CSPs and the general search problem?

4. (25 pts) On Learning:

(a) Assume that you need to learn to predict whom a person will vote for in the next presidential election based on his environment, education and personal history. How would be the steps you would take to be able to come up with a decision tree for this problem?

(b) What criteria would you use to decide on the number of nodes in the decision tree?

(c) Draw a sample decision tree with 4 nodes, and describe in detail the way in which you could come up with this tree based on hypothetical data (generate some data yourself, and show how you use it for building the decision tree).