Test 1 | Artificial Intelligence, Spring 2019 | February 21, 2019 | Total Points = ~~25~~ 25

This is a closed book exam. No electronics or cheat sheets are allowed. All questions carry equal points.

Name:

1. What is wrong with the general 'TREE-SEARCH' algorithm?
2. What are the four components of a node in a search tree? Provide an example using the 8-puzzle game.
3. What are the four ways to evaluate the performance of a search algorithm?
4. Discuss the space and time complexity of the Breadth First Search algorithm.
5. Give a limitation of Breadth First Search.
6. Given the general 'GRAPH-SEARCH' algorithm below which two lines correspond to 'memorizing' the nodes that have already been visited?

```
function GRAPH-SEARCH(problem) returns a solution, or failure
    initialize the frontier using the initial state of problem
    initialize the explored set to be empty
    loop do
        if the frontier is empty then return failure
        choose a leaf node and remove it from the frontier
        if the node contains a goal state then return the corresponding solution
        add the node to the explored set
        expand the chosen node, adding the resulting nodes to the frontier
            only if not in the frontier or explored set
```

7. Assume that we would like to perform univariate linear regression on a dataset consisting of M data points. If we would like to use the 'squared' loss function L_2, what will be the expression for Loss (h_w). h_w is the linear function (model) with weights w? Clearly define all the terms in your expression.
8. Learning involves adjusting weights to minimize a loss. Weight space is defined by all possible settings of the weights. Assume that we have a loss function "Loss(w)" that computes the loss on a given dataset and weights w. In general, the search for best values of weights is a general optimization search problem in a continuous weights space. To minimize loss, we can use the gradient descent algorithm. Assuming that $\frac{\delta y}{\delta x}$ can be used to calculate the partial derivative of a function y = f(x), provide a pseudocode to obtain the optimal weights.
9. Draw a diagram showing how an agent interacts with the environment through sensors and actuators.
10. Do you want to focus your career on algorithms or data? Explain why. Provide a 'binary' answer recalling what we discussed in class.