Homework Uninformed Search

1) For the following tree, list the order in which the nodes are visited for the following three search strategies
   a. Depth-First Search
   b. Depth-First Iterative-Deepening Search
   c. Breath-First Search

```
    1
   / \
  2   3
 /     \
5       4
 / \
11 12  6
 
```

2) Consider the following road map of cities:

```
A  ---  E  ---  B
|    4    |    5    |
|     |     |
|  3  |  2  |
C  ---  E  ---  D
|    1    |    1    |
|     |     |
|  2  |  1  |
```

Each city has a road connecting it to another city. The numbers on the road indicate how long it takes to travel between cities. Suppose you live in city A. You want to plan a trip that visits each city only once that starts and ends at home. For example, the trip ABDCEA (meaning you go from city A to B, then to D, etc) is one such path that would take you 17 hours to follow. Your goal is to choose a path that minimizes the time spent traveling. (Note: this is called the Traveling Salesman Problem, described on pg 68)
   a. Formulate the state space for the problem
   b. Draw a diagram of the complete state space, describing what the actions are
c. Describe a breath first search algorithm, and find the shortest trip from A to A that visits all cities.
d. Compare the time & space requirements for Depth-First search & Breadth-First Search on this problem.
e. Would uniform-cost search work well with this problem?

3)

"Solving" a Jigsaw puzzle

We want to build a “jigsaw puzzle solver”.
You are given 3 jigsaw puzzle pieces, A,B,C and a template.
Your task is to place the pieces A,B,C into the grid, i.e. A→1, B→2, C→3 would be a valid configuration.

You are also given the a set of pair costs which represent how much of a mismatch there is between two pieces. High cost means that these pieces don’t like to be neighbors.

a) Formulate this as a search problem. i.e. define the state space, successor function, initial state, goal state, step cost.
Place the pieces from left to right, i.e. Empty→1→2→3. Avoid placing the same piece twice! Reaching a goal does not necessarily mean you placed the pieces at their optimal location.

b) Draw the search tree and write the step costs on the edges.
Solve this puzzle by hand using depth first search (DFS).
At every evaluation, write 1) the node you evaluate, 2) the nodes in the fringe after the evaluation, 3) the path cost for all nodes in the fringe, e.g. N12; [N1,N4,N8]; [12,34,1].

c) Is the solution guaranteed to be optimal (why or why not?).

d) What is the time and space complexity of DFS in general?

4) Repeat exercise 3b,3c,3d for uniform cost search.