CS341 Artificial Intelligence – Spring 2015
Homework 2 – 60 points
Due: Feb. 2

1. (10 points) Problem 3.3, pg. 113. Note that you are trying to minimize the time it takes to get the friends together. Also, in part **d** it is sufficient to find a map where there exists at least one solution with the stated requirement.

2. (10 points)

   (a) Problem 3.4, pg. 113. Assume for the moment that we list all of the tiles in a single line, one row at a time. The goal state now looks like 1,2,3,4,5,6,7,8,blank, and an initial state might look like 4,2,3,7,5,blank,1,6,8. An *inversion* is a set of two numbers in the list $a$ and $b$ where $a$ comes before $b$ in the list but $a > b$. An example of an inversion would be the numbers 4 and 2 in the initial state listed above. Let $N$ be the total number of inversions in the list (for example in the goal state $N = 0$, while in the initial state listed above $N = 8$). Now consider what legal actions for the 8-puzzle will do to $N$.

   (b) Modify your argument above to prove that the 15-puzzle state space can be divided in a similar manner.

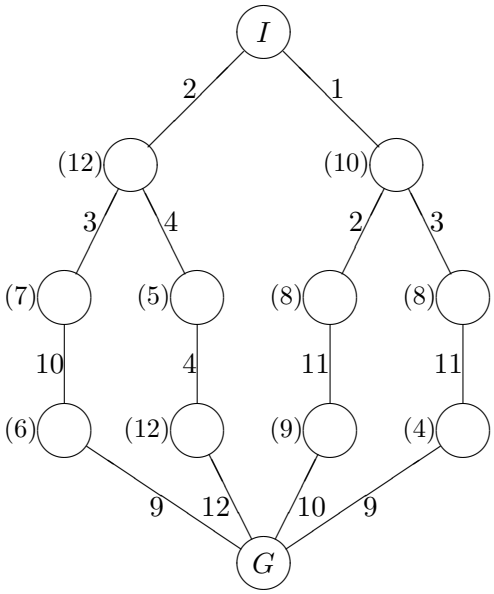
3. (5 points) Problem 3.5, pg. 113.

4. (10 points) Problem 3.9, part a, pg. 115. Use your state space diagram to find a solution to the problem.

5. (10 points) Problem 3.15, pg. 116.

6. (5 points) Problem 3.18, pg. 117.

7. (10 points) Consider the following state space:




The edge weights show action costs and the values in parentheses show the heuristic values $h(n)$ for each node $n$. Show how the RBFS algorithm works to find a solution from the initial state $I$ to the goal state $G$. You need only show what the search tree looks like prior to each rewind, complete with and all $f$ and f-limit values at each node.