CS6364, Spring 2015
Dr. Mithun Balakrishna
Homework 1
Due February 8th, 2015 11:59pm

A. Submission Instructions:

- Submit your solutions via eLearning.
- Please submit a single zip file with the following files:
  - For programming questions:
    - Source code file(s) in C/C++, Java, or Python. For using any other programming language, please get prior approval from the TA.
    - A ReadMe file with instructions on how to compile/run the code.
  - For all other questions, a PDF/Doc/PS/Image file with the solutions.
- Late Submission Penalty:
  - up to 2 hours late — 10% deduction
  - 2 - 4 hours late — 20% deduction
  - 4 - 12 hours late — 35% deduction
  - 12 - 24 hours late — 50% deduction
  - 24 - 48 hours late — 75% deduction
  - more than 48 hours late — 100% deduction (zero credit)

B. Problems:

1. Missionary and Cannibals Problem (50 points)

Three missionaries and three cannibals are on one side of the river, along with a boat that can hold at most two people. Find a way to get everyone from one side of the river to the other side of the river, without leaving any group of missionaries (on either side of the river or in the boat) outnumbered by the cannibals in that place.

a. Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space.
b. Implement programmatically and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states?
c. Why do you think people have a hard time solving this puzzle, given that the state space is so simple?

2. **Define in your own words the following terms (25 points):**
    a. State
    b. State Space
    c. Node
    d. Search Tree
    e. Search Node
    f. Goal
    g. Action
    h. Successor Function
    i. Branching Factor

3. **Prove each of the following statements, or give a counter-example (25 points):**
    a. Breadth-first search is a special case of uniform-cost search.
    b. Depth-first search is a special case of best-first tree search.
    c. Uniform-cost search is a special case of A* search.