

Math Homework 9

CS540

July 19, 2019

1 Instruction

Please submit your answers on Canvas → Assignments → M9. Late submission will not be accepted.

Please add a file named "comments.txt", and in the first line of the file, grade yourself: 1, 1.5, 2 (for the entire homework, not for individual questions). In your submission, please do not write your name if you do not want other students to see it (in the case it is posted as a sample solution).

Grade	Meaning
1	You attempted something but mostly incorrect.
1.5	You attempted something but there are mistakes.
2	You have the correct answers + permission to post as a sample solution.

You can put 2.5 if you already got 2 in the Quizzes for the week.

2 Questions

2.1 Question 1

Fall 2018 Midterm Q2, Fall 2017 Midterm Q13, Fall 2010 Final Q2

Suppose the states are positive integers between 1 and 10, initial state is 1, goal state is 9, successors of i is $2i$ and $2i + 1$ (if exist). What is a vertice expansion sequence with the following search strategies?

1. Breadth First
2. Depth First
3. Iterative Deepening

2.2 Question 2

Fall 2010 Midterm Q1

You have two jugs, measuring 3 gallons and 4 gallons, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure exactly 2 gallons. Let state (a, b) mean the amount of water in the 3 and 4 gallon jugs, respectively. Define all successors of this state. Write down a solution path from $(0, 0)$.

2.3 Question 3

Spring 2017 Midterm Q1

Given the following adjacency matrix of the state digraph. What is a vertice expansion sequence with the following search strategies?

1. Uniform Cost
2. Best First Greedy
3. A

–	S	A	B	C	D	E	G
S	$h = 6$	2	1	–	–	–	9
A	–	$h = 0$	–	2	3	–	–
B	–	–	$h = 6$	–	2	4	–
C	–	–	–	$h = 4$	–	–	4
D	–	–	–	–	$h = 1$	–	4
E	–	–	–	–	–	$h = 10$	–
G	–	–	–	–	–	–	$h = 0$

2.4 Question 4

For the previous question. Prove that the heuristic is admissible.

2.5 Question 5

Which ones of the following are admissible heuristic function? Explain.

- A: $h(s) = h^*(s)$.
- B: $h(s) = \max\{2, h^*(s)\}$.
- C: $h(s) = \min\{2, h^*(s)\}$.
- D: $h(s) = h^*(s) - 2$.
- E: $h(s) = \sqrt{h^*(s)}$.