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ECE 448 - HW1

Problem 1

a)

i. Depth First Search

n	q
-	A
A	B,C,D
B	E,F,C,D
E	J,F,C,D
J	goal found

ii. Breadth First Search

n	q
-	A
A	B,C,D
B	C,D,E,F
C	D,E,F,G,H
D	E,F,G,H,I
E	F,G,H,I,J
F	G,H,I,J
G	H,I,J,K,L
H	goal found

iii. Greedy Search/Best First Search

n	q
-	A
A	C,D,B
C	H,D,G,B
H	goal found

iv. Uniform Cost

n	q
-	A
A	C,D,B
C	D,B,G,H
D	B,G,I,H
B	E,G,F,I,H
E	G,F,I,H,J
G	F,I,L,H,K
F	I,L,H,K
I	goal found

v. A*

n	q
-	A
A	C,D,B
C	D,B,G,H
D	I,B,G,H
I	goal found

Problem 1**b)**

The heuristic h is admissible and consistent because all nodes are true for $h(n) \leq \text{cost}(n, a, n') + h(n')$ and $h(n) \leq h^*(n)$.

c)

It is guaranteed to find the best answer using Uniform Cost and A* searches. They take into account the actual work it took to get there when sorting the next nodes to search.

Problem 2**a)**

$$df/dx = 2a_1x + b_1y + c_1$$

$$df/dy = 2a_2y + b_1x + c_2$$

b)

This function is convex in both regions because all of its curvatures across both regions are positive.

c)

This function is also convex because all of its curvatures across the region are positive.