Homework 2

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1 Search

1.1 Breadth First Search (BFS)

Open (Queue) [Top is towards the right]	Closed
A(Null)	
D(A), C(A), B(A)	A(Null)
E(B), A(B), D(A), C(A)	A(Null), B(A)
G(C), F(C), E(C), A(C), E(B), A(B), D(A)	A(Null), B(A), C(A)
A(D), G(C), F(C), E(C), A(C), E(B), A(B)	A(Null), B(A), C(A), D(A)
A(D), G(C), F(C), E(C), A(C), E(B)	A(Null), B(A), C(A), D(A)
G(E), C(E), B(E), A(D), G(C), F(C), E(C), A(C)	A(Null), B(A), C(A), D(A), E(B)
G(E), C(E), B(E), A(D), G(C), F(C), E(C)	A(Null), B(A), C(A), D(A), E(B)
G(E), C(E), B(E), A(D), G(C), F(C)	A(Null), B(A), C(A), D(A), E(B)
G(F), C(F), G(E), C(E), B(E), A(D), G(C)	A(Null), B(A), C(A), D(A), E(B), F(C)

Pop G(C) off and running goal-test returns a Success.
Following the back pointers the path is:

$$G \leftarrow C \leftarrow A =$$
$$A \rightarrow C \rightarrow G$$

1.2 Depth First Search (DFS)

OPEN (Stack) [Top is towards the left]	Closed
A(Null)	
B(A), C(A), D(A)	A(Null)
A(B), E(B), C(A), D(A)	A(Null), B(A)
E(B), C(A), D(A)	A(Null), B(A)
B(E), C(E), G(E), C(A), D(A)	A(Null), B(A), E(B)
C(E), G(E), C(A), D(A)	A(Null), B(A), E(B)
A(C), E(C), F(C), G(C), G(E), C(A), D(A)	A(Null), B(A), E(B), C(E)
E(C), F(C), G(E), C(A), D(A)	A(Null), B(A), E(B), C(E)
F(C), G(E), C(A), D(A)	A(Null), B(A), E(B), C(E)
C(F), G(F), G(E), C(A), D(A)	A(Null), B(A), E(B), C(E), F(C)
G(F), G(E), C(A), D(A)	A(Null), B(A), E(B), C(E), F(C)

Pop G(F) off and running goal-test returns a Success.
Following the back pointers the path is:

$$\text{G} \leftarrow \text{F} \leftarrow \text{C} \leftarrow \text{E} \leftarrow \text{B} \leftarrow \text{A} =$$
$$\text{A} \rightarrow \text{B} \rightarrow \text{E} \rightarrow \text{C} \rightarrow \text{F} \rightarrow \text{G}$$

1.3 Iterative Deepening

Pass 1

Open [Top at left]	Closed
A(Null)	
B(A), C(A), D(A)	A(Null)
C(A), D(A)	A(Null), B(A)
D(A)	A(Null), B(A), C(A)
	A(Null), B(A), C(A), D(A)

Pop D(A) off and running goal-test fails, thus this iteration fails.

Pass 2

Open [Top at Left]	Closed
A(Null)	
B(A), C(A), D(A)	A(Null)
C(A), D(A), A(B), E(B)	A(Null), B(A)
D(A), A(B), E(B), A(C), E(C), F(C), G(C)	A(Null), B(A), C(A)
A(B), E(B), A(C), E(C), F(C), G(C), A(D)	A(Null), B(A), C(A), D(A)
E(B), A(C), E(C), F(C), G(C), A(D)	A(Null), B(A), C(A), D(A)
A(C), E(C), F(C), G(C), A(D)	A(Null), B(A), C(A), D(A), E(B)
E(C), F(C), G(C), A(D)	A(Null), B(A), C(A), D(A), E(B)
F(C), G(C), A(D)	A(Null), B(A), C(A), D(A), E(B)
G(C), A(D)	A(Null), B(A), C(A), D(A), E(B), F(C)

Pop G(C) off and running goal-test returns a Success.
Following the back pointers the path is:

$$\begin{gathered} G \leftarrow C \leftarrow A = \\ A \rightarrow C \rightarrow G \end{gathered}$$

1.4 Uniform Cost Search

Open [Top at left]	Closed
A(0,Null)	
D(1,A), B(2,A), C(5,A)	A(0,Null)
A(2,D), B(2,A), C(5,A)	A(0,Null), D(1,A)
B(2,A), C(5,A)	A(0,Null), D(1,A)
A(4,B), C(5,A), E(5,B)	A(0,Null), D(1,A), B(2,A)
C(5,A), E(5,B)	A(0,Null), D(1,A), B(2,A)
E(5,B), E(6,C), F(7,C), G(9,C), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A)
C(6,E), E(6,C), F(7,C), B(8,E), G(9,C), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A), E(5,B)
E(6,C), F(7,C), B(8,E), G(9,C), G(9,E), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A), E(5,B)
F(7,C), B(8,E), C(9,F), G(9,C), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A), E(5,B)
B(8,E), G(8,F), C(9,F), G(9,C), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A), E(5,B), F(7,C)
G(8,F), C(9,F), G(9,C), A(10,C)	A(0,Null), D(1,A), B(2,A), C(5,A), E(5,B), F(7,C)

Pop G(8,F) off and running goal-test returns a Success.
Following the back pointers the path is:

$$\begin{gathered} G \leftarrow F \leftarrow C \leftarrow A = \\ A \rightarrow C \rightarrow F \rightarrow G \end{gathered}$$

The Length of this Path is:

$$5 + 2 + 1 = 8 \tag{1}$$

1.5 A*

Open [Top at left]	Closed
A(2,Null)	
D(4,A), C(7,A), B(9,A)	A(2,Null)
C(7,A), B(9,A)	A(2,Null), D(4,A)
E(8,C), F(8,C), B(9,A), G(9,C)	A(2,Null), D(4,A), C(7,A)
F(8,C), B(9,A), G(9,C)	A(2,Null), D(4,A), C(7,A), E(8,C)
G(8,F), B(9,A)	A(2,Null), D(4,A), C(7,A), E(8,C), F(8,C)

Pop G(8,F) off and running goal-test returns a Success.
Following the back pointers the path is:

$$G \leftarrow F \leftarrow C \leftarrow A =$$
$$A \rightarrow C \rightarrow F \rightarrow G$$
The Length of this Path is:

$$5 + 2 + 1 = 8 \tag{2}$$