REVIEW EXERCISE 02

Question 1. *Missionaries and Cannibals.* Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

Consider a state as a tuple of values. Which values should be included in the tuple?

From this point, answer the following questions according to the definition of a state above.

Define the initial state and the goal state.

Define the successor function in this representation.

What is the path cost in your successor function?

What is the maximum number of states in the state space, i.e., including illegal states?

What is the total number of reachable states?

Draw a diagram of the complete state space.

Question 2. Consider the following graph, in which S and G are the initial and goal states, respectively. The heuristic values are shown under the vertices' names, while path costs are shown on every edges.
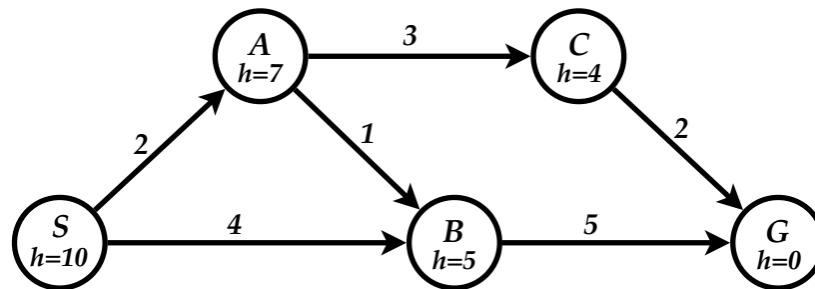
For each of the search strategies listed below,

(a) list, in order, the states expanded,

(b) list, in order, the states included in the found path, and

(c) show the final content of the frontier (recall that a state is expanded when it is removed from the frontier)

When all else is equal, nodes should be expanded in alphabetical order.

a. Breadth-first search (BFS) (shown as an example)

List of expanded nodes:_____S   A   B_____

Path found: _____S   B   G_____

Frontier = {_____C_____}

b. Uniform-cost search (UCS)

List of expanded nodes:_____

Path found:_____

Frontier = {_____}

c. Depth-first search (DFS) (Avoid loops by remembering nodes on the current path).

List of expanded nodes: _____

Path found: _____

d. Iterative deepening search (IDS)

List of expanded nodes for each limit: {_____} {_____} {_____}

Path found: _____

e. Greedy best first search (GBFS)

List of expanded nodes: ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

Path found: ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

Frontier = {⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯}

f. A* search

List of expanded nodes: ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

Path found: ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯

Frontier = {⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯}

g. Is the given heuristic admissible?

h. Is the given heuristic consistent?