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**Part I: Written Problems (50 points)**

0.1 Uninformed Search (23 points)

We define a state space as follows. The start state is 1. The successor function for state n returns two

states, which are numbered 3n and 3n + 2. The goal state is 35.

(a) (4 pts) Draw the state space involving only states 1 to 35.

(b) (5 pts) List the order in which nodes will be visited for breadth first search.

(c) (5 pts) List the order in which the nodes will be visited for depth-limited search with limit 3.

(d) (5 pts) List the order in which the nodes will be visited for iterative deepening search.

(e) (4 pts) Is bidirectional search appropriate for this problem? Explain your answer.

**Answer:**

**0.2 Informed Search (27 points)**

Consider the problem of getting to Bucharest from Oradea in the map below:

Chart, radar chart

Description automatically generated

When answering the following questions, assume that (1) each node should be expanded at most

once; and (2) if needed, break ties alphabetically.

(a) (10 pts) Trace the operation of the UCS search algorithm applied to this problem by showing

the state that is expanded and its successor states (together with their g values) in each iteration

of the algorithm.

(b) (7 pts) Trace the operation of the best-first greedy search algorithm applied to this problem by

showing the state that is expanded and its successor states (together with their h values) in each

iteration of the algorithm. Use the straight-line distance heuristic values shown to the right of

the map.

(c) (10 pts) Trace the operation of the A\* search algorithm applied to this problem by showing the

state that is expanded and its successor states (together with their g, h, and f values) in each

iteration of the algorithm. Use the straight-line distance heuristic values shown to the right of

the map.

**Answer:**