For each problem on this test, below “Perfect” gives the percentage who received full credit, “Partial” gives the percentage who received partial credit, and “Zero” gives the percentage of students who received zero credit.

(Due to rounding, values below may be only approximate estimates.)

Problem 1
Perfect: ~5.1% (~3 Students), Partial: ~94.9% (~56 Students), Zero: ~0% (~0 Students)

Problem 2
Perfect: ~61.0% (~36 Students), Partial: ~39.0% (~23 Students), Zero: ~0% (~0 Students)

CS-171, Intro to A.I., Summer Quarter, 2016 — Quiz # 3 — 20 minutes

NAME: _____

YOUR ID:_____ ID TO RIGHT:_____ ROW:_____ SEAT:_____

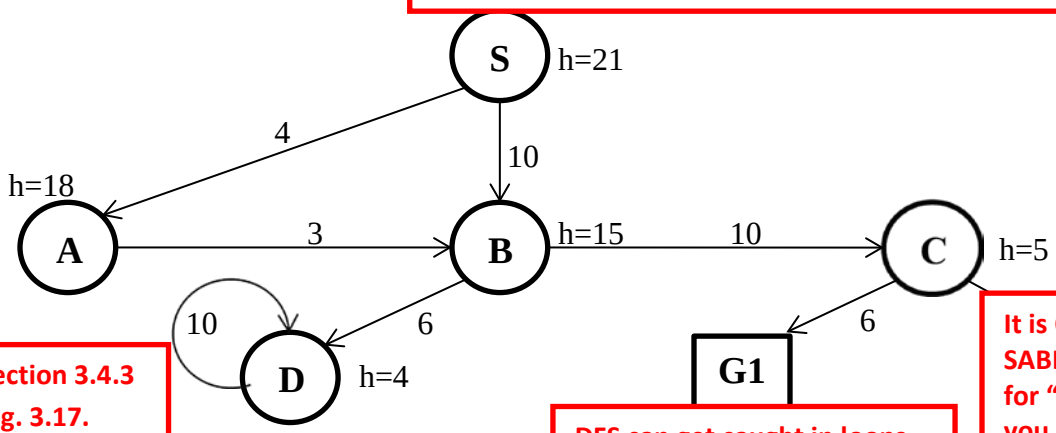
1. (60 pts total, 12 pts each) STATE-SPACE SEARCH. Execute Tree Search through this graph (do not remember visited nodes, so repeated nodes are possible). It is not a tree, but pretend you don't know that. Step costs are given next to each arc, and heuristic values are given next to each node (as h=x). The successors of each node are indicated by the arrows out of that node. **(Note: D is a successor of itself).** As usual, successor nodes are returned in left-to-right order. (The successor nodes of S are A,B; and the

The start node is S and there are tw

(1) the order in which nodes are expanded

Write "None" for the path and cost if the g

Please see the lecture slides for Uninformed Search, topic "When to do Goal-Test? When generated? When popped?" for clarification about exactly what to do in practical cases.



See Section 3.4.3 and Fig. 3.17.

It is OK if you wrote SABDDD... instead of None for "Path found." It is OK if you said N/A for "Cost of path found," or left it blank.

1.a. (example) DEPTH-FIRST SEARCH:

1.a.i Order of expansion: S A B D D D D ...

DFS can get caught in loops during Tree Search (= do not remember visited nodes).

1.a.ii Path to goal found: None Cost of path found: None

1.b. (12 pts) BREADTH-FIRST SEARCH:

See Section 3.4.1 and Fig. 3.11.

on: S A B B D C G1

BFS does the Goal-test before the child is pushed onto the queue. The goal G1 is found when C is expanded.

1.b.ii Path to goal found: S B C G1 Cost of path found: 26

1.c. (12 pts) ITERATIVE DEEPENING SEARCH:

See Sections 3.4.4-5 and Figs. 3.18-19.

S S A B S A B B D C G1

IDS does the Goal-test before the child is pushed onto the queue. The goal G1 is found when C is expanded.

1.c.ii Path to goal found: S B C G1 Cost of path found: 26

1.d. (12 pts) UNIFORM COST SEARCH:

UCS does Goal-test when node is popped off

See Section 3.4.2 and Fig. 3.14.

on: S A B B D D C C G2

nd: S A B C G2 Cost of path found: 22

1.e. (12 pts) GREEDY BEST FIRST SEARCH

GBFS can get caught in loops during Tree Search (= do not remember visited nodes). The heuristic value at node D (h=4) is lower than any other heuristic value on the queue.

See Section 3.5.1 and Fig. 3.23.

on: S B D D D D ...

nd: None Cost of path found: None

1.f. (12 pts) A* SEARCH:

A* does Goal-test when node is popped off

See Section 3.5.2 and Figs. 3.24-25.

on: S A B D C G2

d: S A B C G2 Cost of path found: 22

****** TURN PAGE OVER AND CONTINUE ON THE OTHER SIDE ******

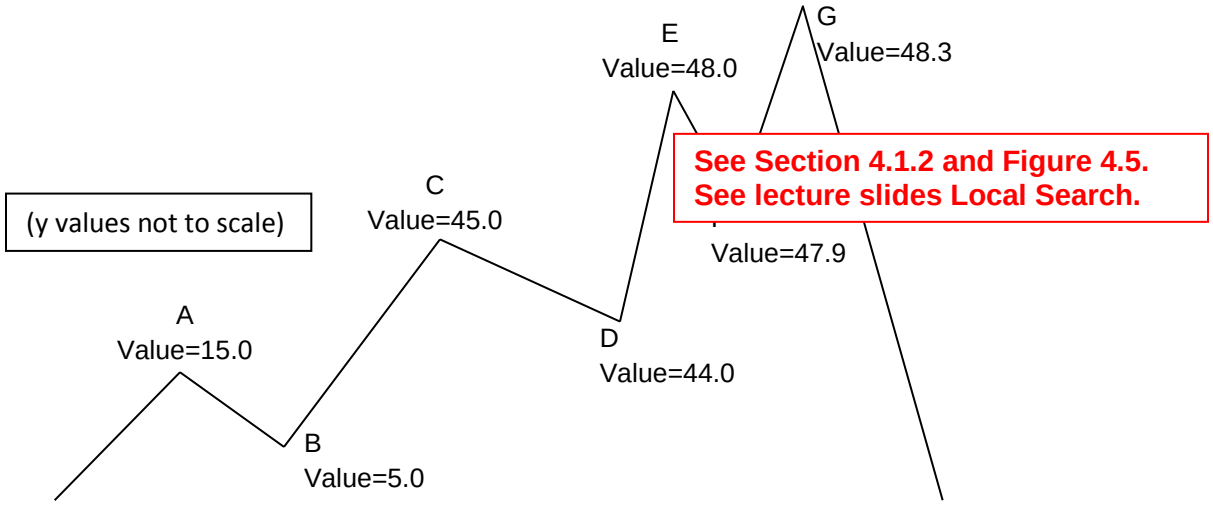
2. (40 pts total, 5 pts each) LOCAL SEARCH --- SIMULATED ANNEALING.
This question asks about Simulated Annealing local search. In the value landscape cartoon below, you will be asked about the probability that various moves will be accepted at different temperatures. Recall that Simulated Annealing always accepts a better move (ΔValue = Value[next] – Value[current] > 0.0); but it accepts a worse move (ΔValue < 0.0) only with probability e^(ΔValue/T), where T is the current temperature on the temperature schedule.

Please use this temperature schedule (usually, it is a decaying exponential; but it is simplified here):

time (t)	1-100	101-200	201-300
Temperature (T)	10.0	1.0	0.1

You do not need a calculator; the values given have been chosen to follow this table:

x	0.0	-0.1	-0.4	-1.0	-4.0	-40.0
e^x	1.00	≈0.90	≈0.67	≈0.37	≈0.02	≈4.0e-18



Give your answer to two significant decimal places. **The first one is done for you as an example.**

2.a. (example) You are at Point A and t=23. **The probability you will accept a move A -> B =** 0.37

2.b. (5 pts) You are at Point B and t=23. **The probability you will accept a move B -> C =** 1.00

2.c. (5 pts) You are at Point C and t=123. **The probability you will accept a move C -> B =** 4.0e-18

2.d. (5 pts) You are at Point C and t=123. **The probability you will accept a move C -> D =** 0.37

2.e. (5 pts) You are at Point E and t=123. **The probability you will accept a move E -> D =** 0.02

2.f. (5 pts) You are at Point E and t=123. **The probability you will accept a move E -> F =** 0.90

2.g. (5 pts) You are at Point G and t=123. **The probability you will accept a move G -> F =** 0.67

2.h. (5 pts) You are at Point G and t=223. **The probability you will accept a move G -> F =** 0.02

2.i. (5 pts) With a very, very, very long slow annealing schedule, are you more likely, eventually in the long run, to wind up at point A or at point G? **(write A or G)** G .