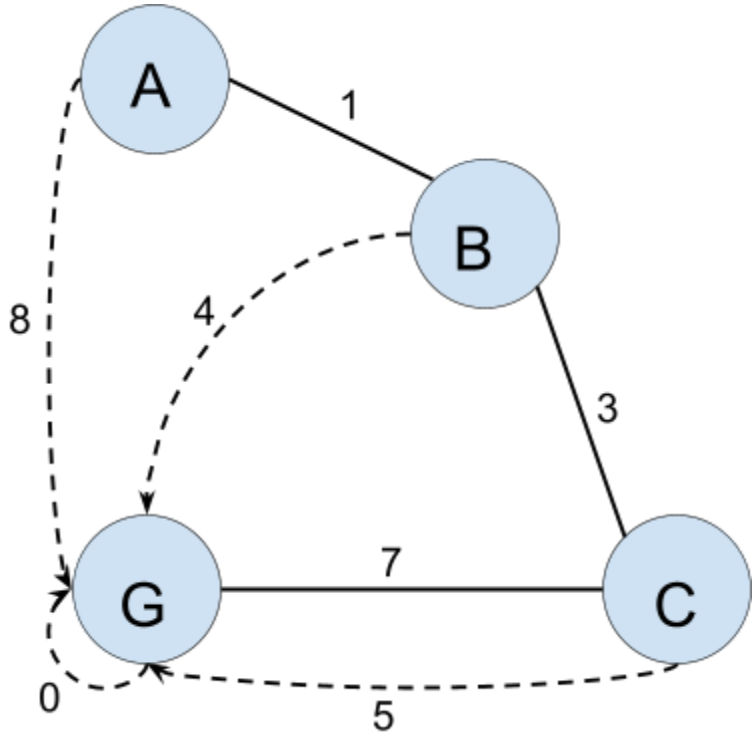
Name:

NetID:

1.) For the graph given below answer the questions. The cost to travel between nodes are given as/on the solid lines and the heuristic distances are on the dashed lines. (2 pts.)



a.) Is this heuristic admissible? Why or why not?

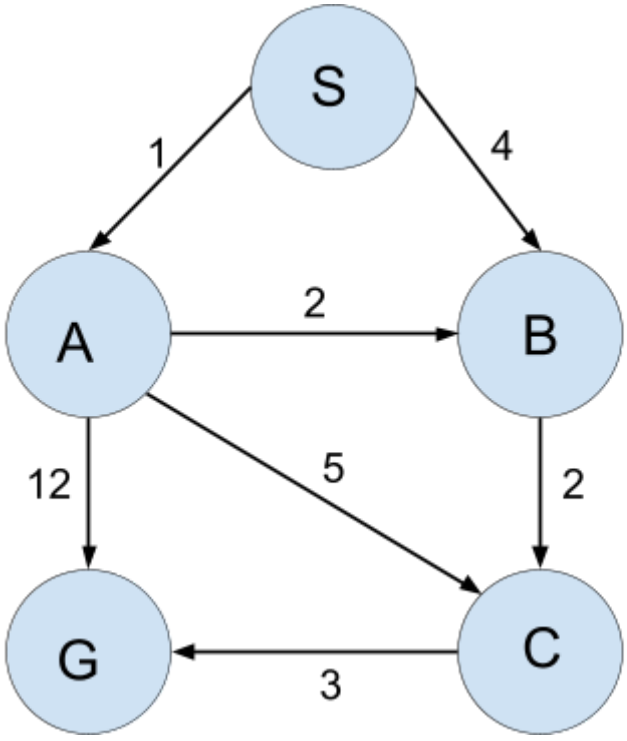
yes, $h(n) \leq d(n, g)$ for all nodes

b.) Is this heuristic consistent? Why or why not?

no $h(n) \leq d(n, n') + h(n')$ is not true for all nodes

$8 \leq 1+4 \rightarrow$ false

2.) Given the following graph, starting in Node S and trying to get to Node G, trace the steps the A* Algorithm would take. To make the graph less busy, the heuristic distances are given as a table. (5 pts.)



N	h(N)
S	7
A	6
B	2
C	1
G	0

*.) N -> N' = d(N, N') + h(N', G)

1.) S -> A = 1 + 6 = 7

~~2.) S -> B = 4 + 2 = 6~~

~~3.) S -> B -> C: 6+1=7~~

~~4.) S -> B -> C -> G: 9~~

~~5.) S -> A -> B: 3+2=5~~

6.) S -> A -> C: 6+1= 7

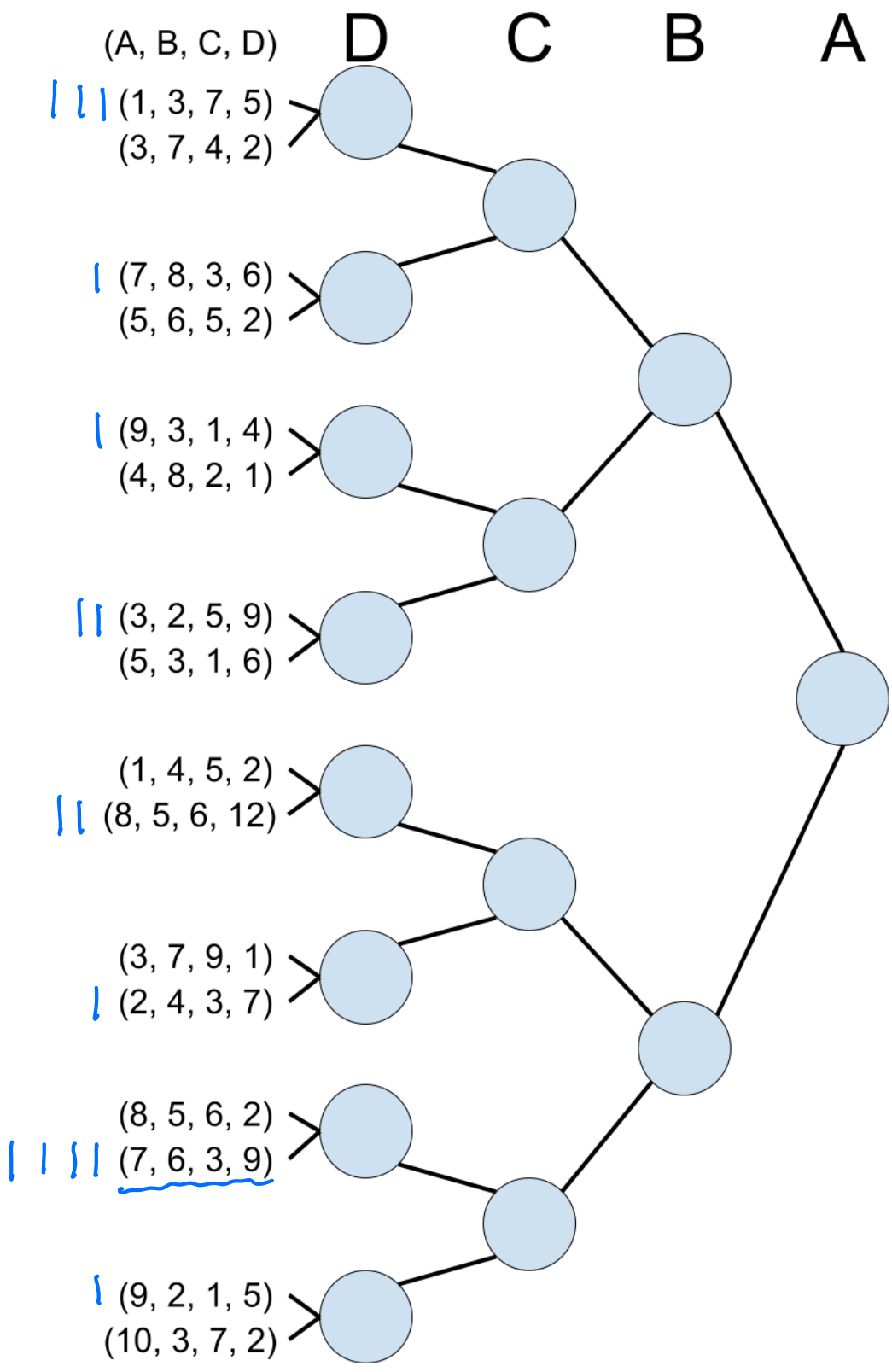
~~7.) S -> A -> G: 13+0=13~~

~~8.) S -> A -> B -> C: 5+1=6~~

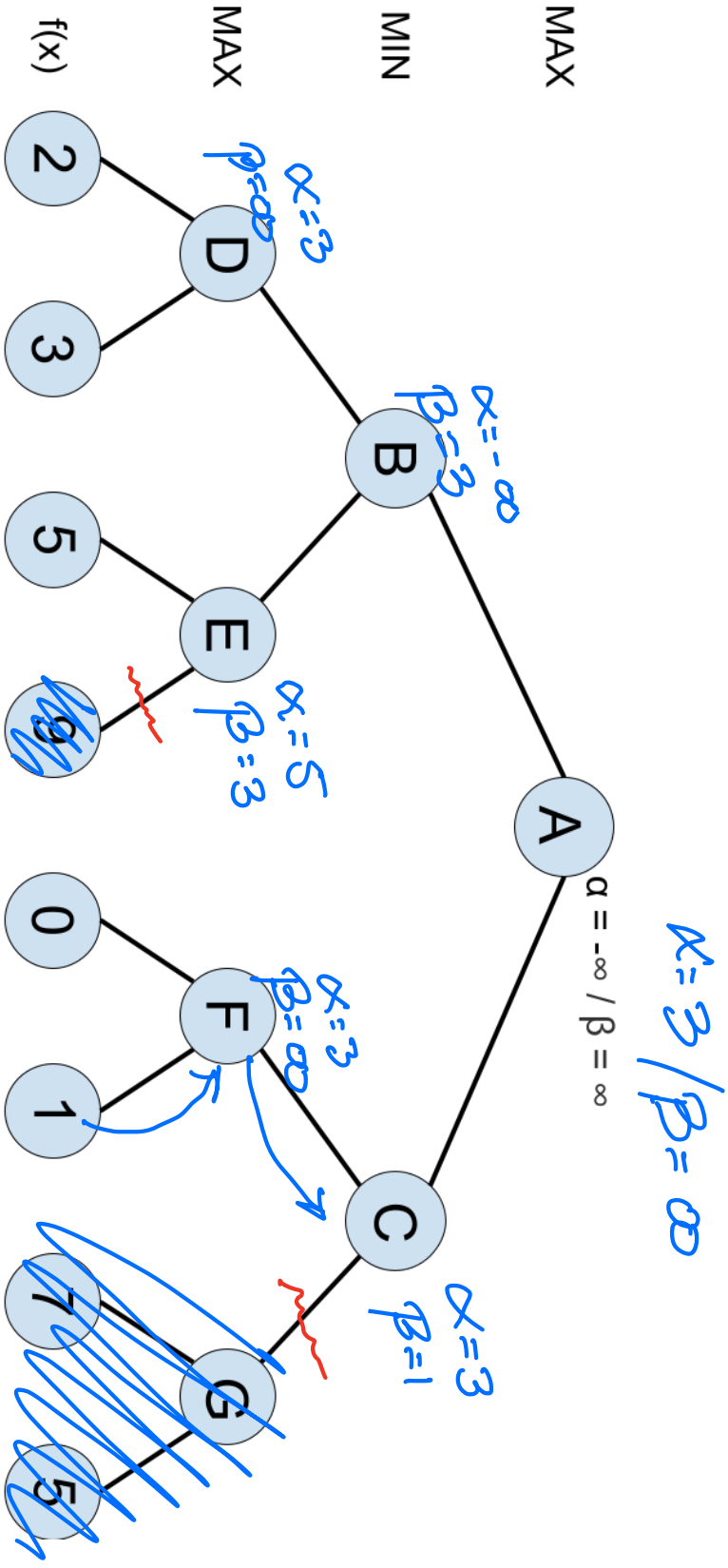
9.) S -> A -> B -> C -> G = 8 *

~~10.) S -> A -> C -> G: 9+0=9~~

3.) Show which tuple of numbers gets chosen for each level of a 4 player minimax tree. (5 pts.)



4.) Use Alpha/Beta Pruning on the tree below, showing the Alpha and Beta at each node and show which branches don't need to be explored. (8 pts.)



5.) Answer the following two questions about Constraint Satisfaction Problems (CSPs). (2 pts.)

a.) Explain in your own words how the backtracking algorithm for CSPs works and is implemented.

Using DFS we traverse down the assignment tree trying different combinations of assignments and check constraints after each assignment /at each node. If an assignment violates a constraint we backtrack and try something else

b.) How does forward checking or constraint propagation improve on basic backtracking?

Using the algorithm above as a base, with constraint propagation when we make an assignment we remove it from domains of "nearby" variables (arcs). If we get a variable with an empty domain we can backtrack early

6.) Given the following dataset layout, answer the two questions. (6 pts.)

	S	X		Y
	S	X_1	X_2	Y
Train	S	3.9	4.2	0
	S	2.7	8.5	1
	S	4.1	4.0	0
	.			
	.			
Test	S_{n-1}	3.1	7.9	1
	S_n	4.0	3.8	0

a.) How do we derive the mu and sigma for a gaussian PDF during the training or fitting step of a Naive Bayes classifier?

For each feature, for each class we take all associated values and calculate μ and σ. For this dataset we'd have 4 of them.

b.) What is the role of the gaussian PDF during the prediction step of using a Naive Bayes classifier and what assumption do we make by using a Gaussian distribution?

Using the gaussian PDF we can get the likelihood of a value belonging to a certain class. We assume features follow a gaussian distribution

NOTE: I don't expect any math here, just use words and pictures if you like.

7.) In your own words, answer the following to questions about perceptrons. (2 pts.)

a.) What is the purpose of the activation function in the perceptron?

The activation function squashes outputs into a defined range. The step function gives class labels

b.) What is the purpose of the weight update function (beyond just updating the weights) in the perceptron?

It changes where the seperating line is drawn.

Bonus.) From which lecture do you think you learned the most and why do you believe that was the case? (I really want to improve the clarity of the lectures 🙂please help me) (1 pt.)