

CECS 451
Assignment 8
Total: 25 Points

- Submit a PDF file in the Assignment folder via Canvas (Not email)
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1. Consider the 101 x 3 world. In the *Start* state the agent has a choice of two deterministic actions, Up or Down, but in the other states the agent has one deterministic action, Right. Assuming a discounted reward function and $R(s_0) = 0$.

+50	-1	-1	-1	...	-1	-1	-1	+10
<i>Start</i>				...				
-50	+1	+1	+1	...	+1	+1	+1	-10

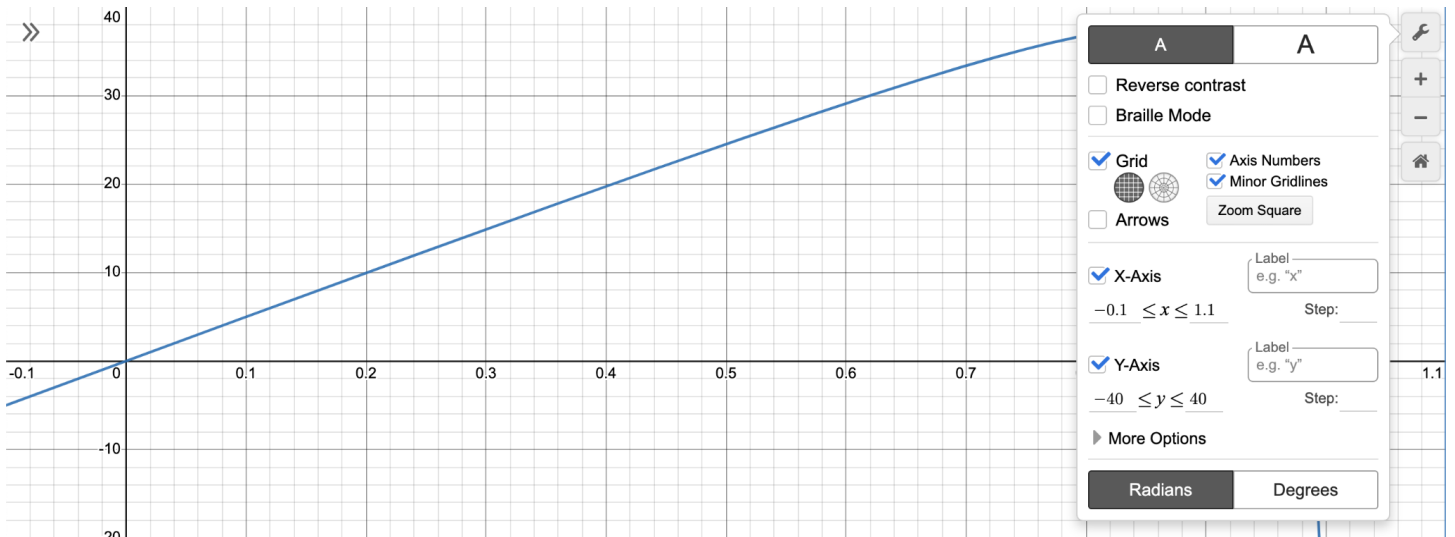
- a. (4 points) Compute the utility of each action as a function of γ .
 - b. (4 points) Draw the utility of each action for the range $0 \leq \gamma < 1$ using Matlab, [Desmos](#) or your familiar numerical analysis software.
 - c. (2 points) For $\gamma = \frac{1}{2}$, which action is recommended? Why?
2. Consider the following data set comprised of three binary input attributes (A_1 , A_2 , and A_3) and one binary output:

Example	A_1	A_2	A_3	Output y
x_1	1	0	0	0
x_2	1	0	1	0
x_3	0	1	0	0
x_4	1	1	1	1
x_5	1	1	0	1

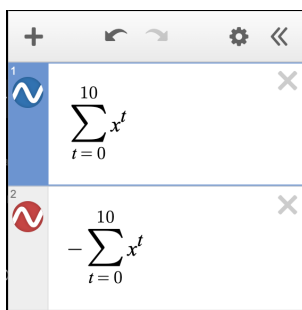
- a. (3 points) Compute Gain(A_1)
- b. (3 points) Compute Gain(A_2)
- c. (3 points) Compute Gain(A_3)

3. (6 points) Consider the XOR function of three binary input attributes (A1, A2, and A3), which produces the value 1 if and only if an odd number of the three input attributes has value 1. Draw a minimal-sized decision tree for the three-input XOR function.

Desmos Settings Recommendation for 1b (x-axis: $0 \leq \gamma < 1$)



The example above illustrates the utility of a single action, there should be two.



(Note: The provided functions are only examples and not the actual functions used.)