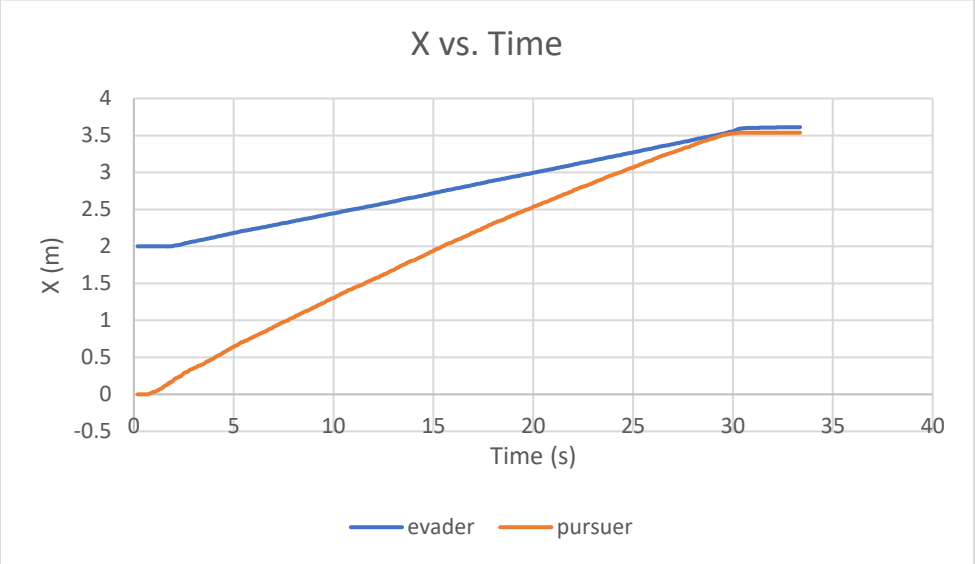
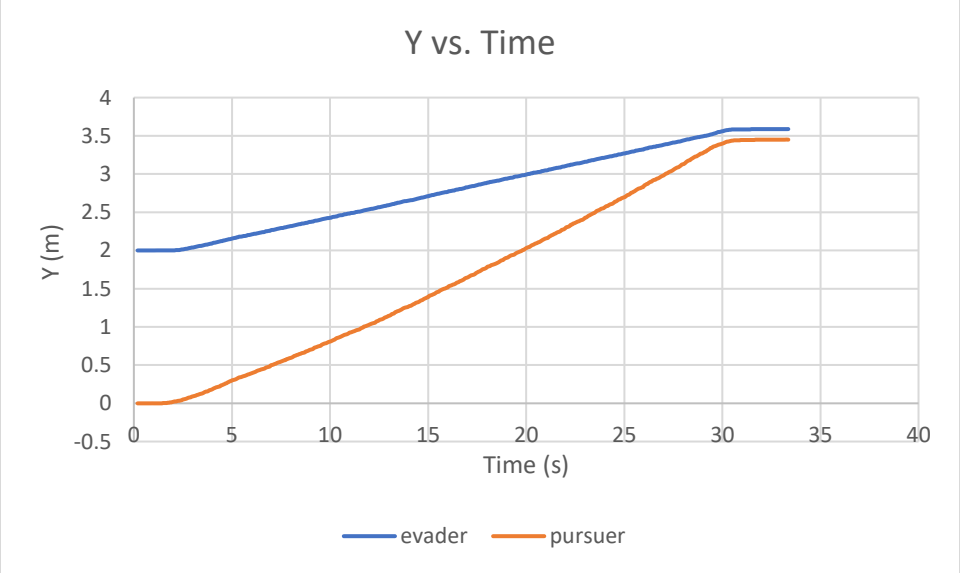
ME 401/5501 – Robotics and Unmanned Systems
HW #6: DUE April 14th, 2022
Proportional Navigation - Pursuit

Problem 1:
Using the random_evader = False condition, create a pursuit script/node that chases after the evading turtblebot. You must use proportional navigation. You will need to tune your PN constant to provide suitable response. You must collide with the evading turtlebot within a simulation time of 30 seconds.
Provide evidence to show your pursuit vehicle working (x vs y plot of both evader and pursuer for example).
Identify your PN constant.

```
rate_val = 100
N_val = 10
```



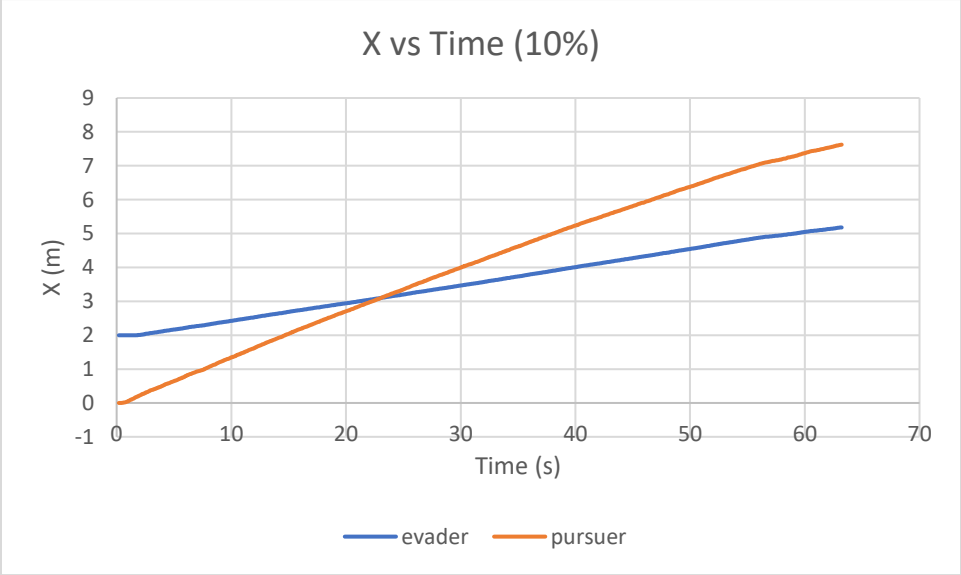


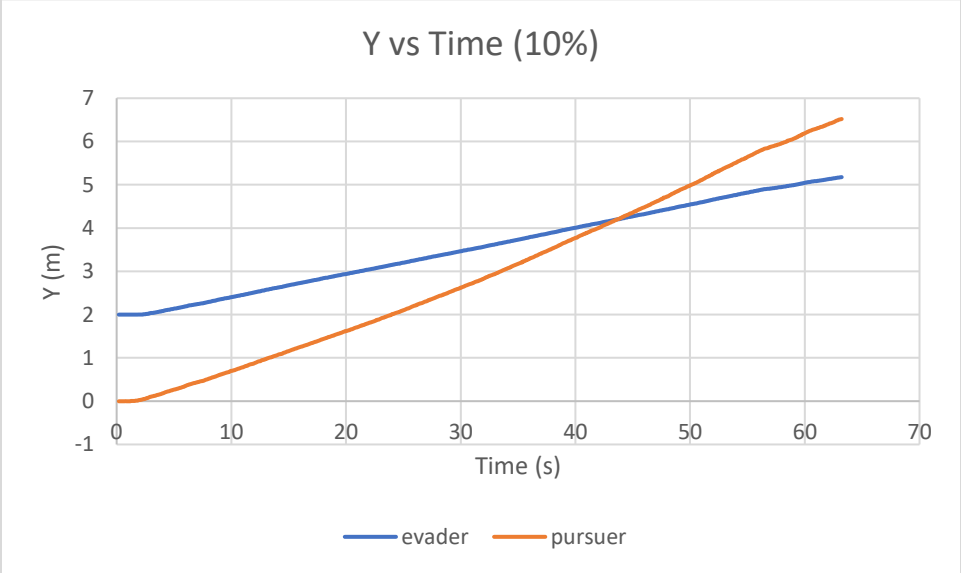
Collision occurred!

Problem 2:

Using the random_evader = False condition, test out your working pursuit script. Although random between tests, perform 3 tests with PN constant = 10% of problem 1 value, 100%, and 1000%. How does the performance change in in terms of capturing the random evader? Provide plots/figures to support what you see.

```
N_val = 1 #10%
```





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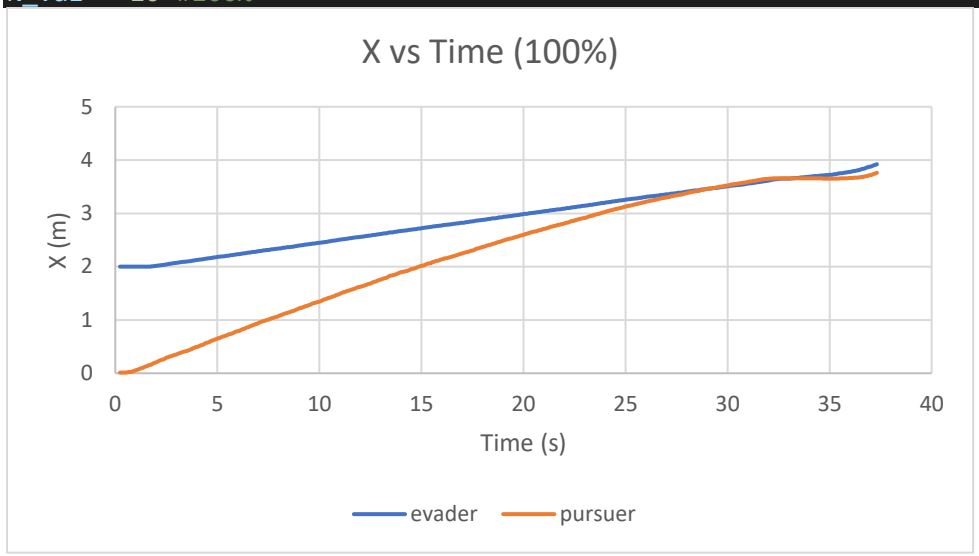
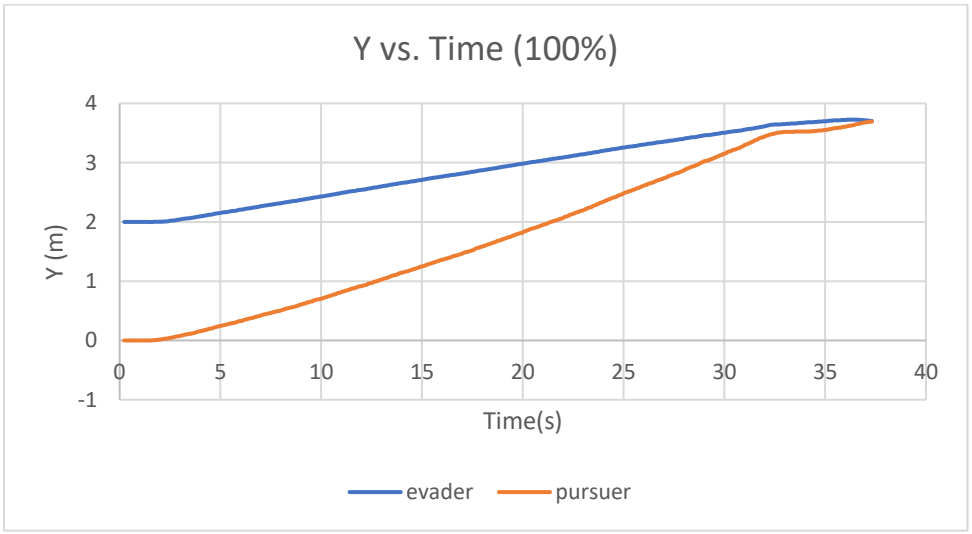
```
N_val = 10 #100%
```





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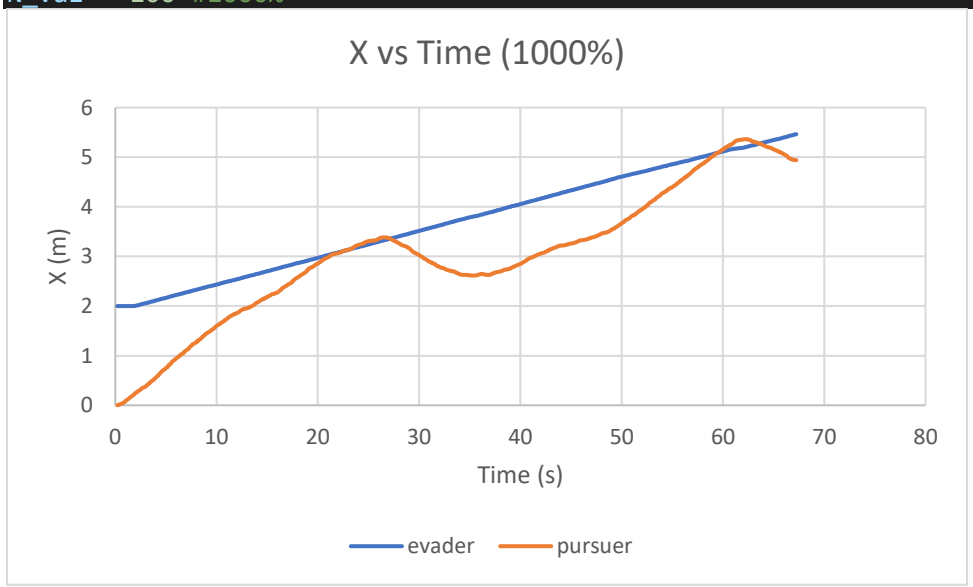
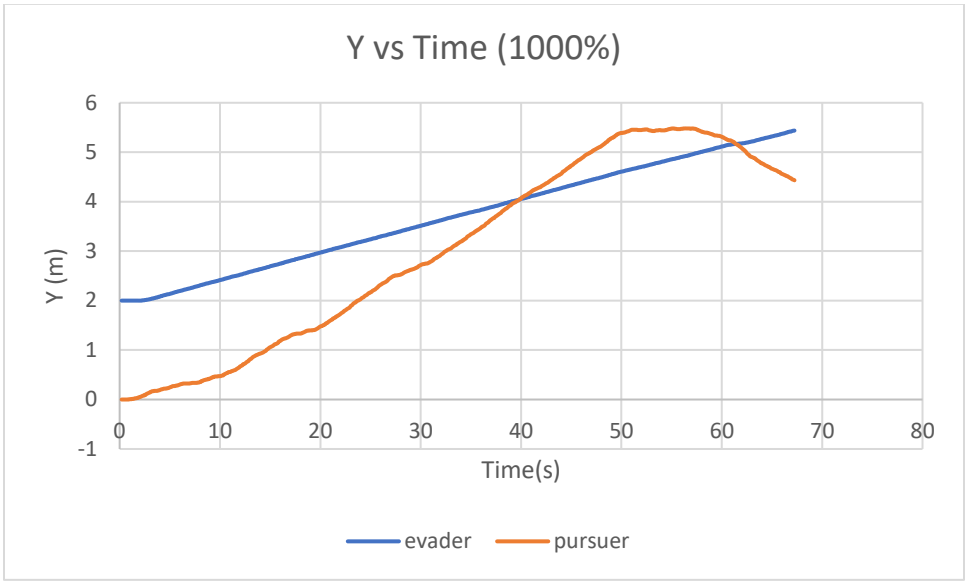
```
N_val = 100 #1000%
```





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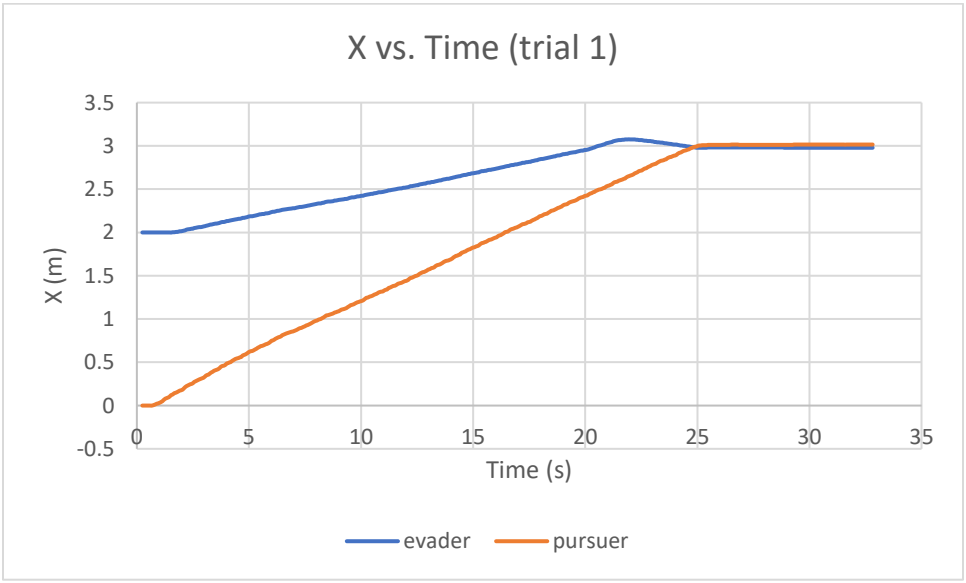
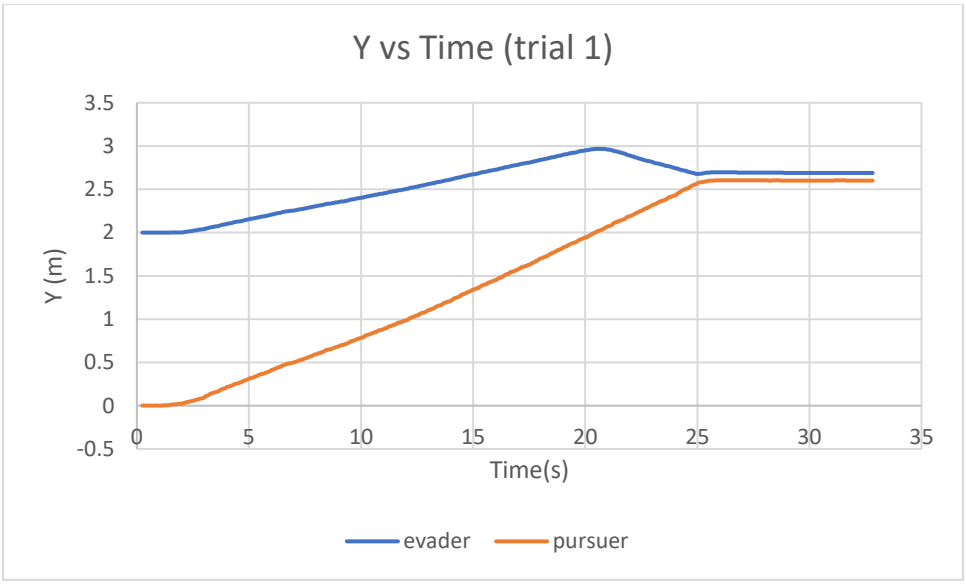
Problem 3:

Using the random_evader = True condition, test out your pursuit script. Comment on how it performs (run this simulation a few times to compare). Provide plots/figures to support what you see.

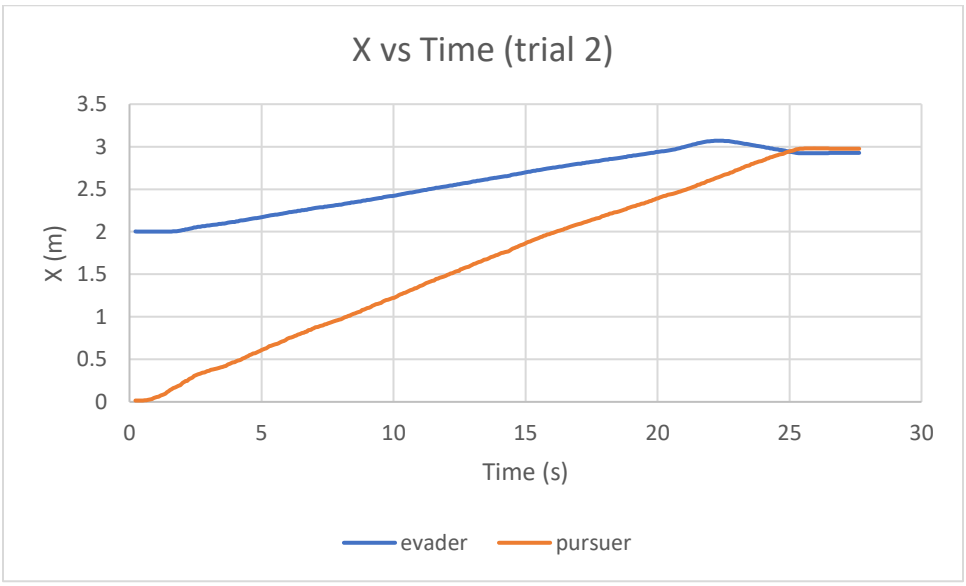
Trial 1:

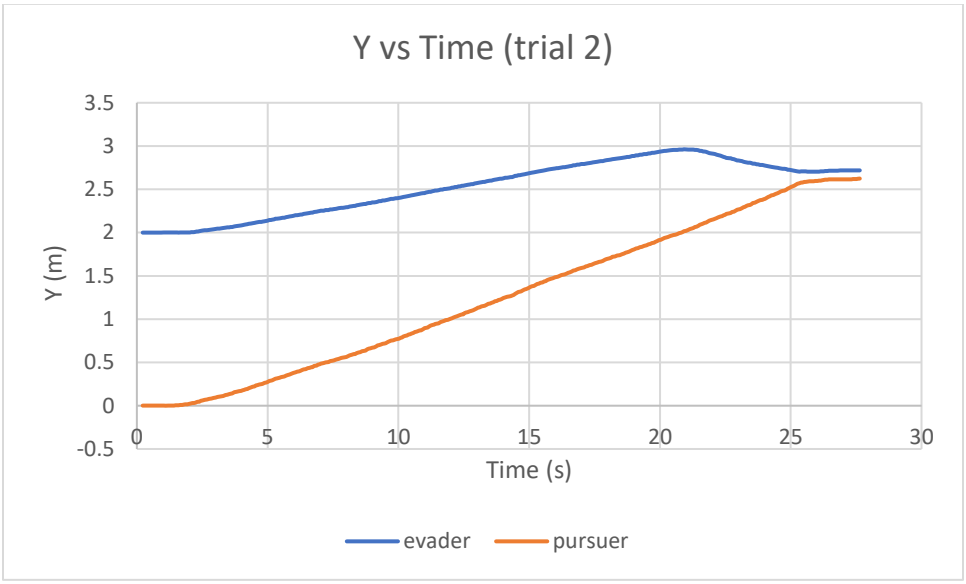




Collision Occured!

Trial 2:





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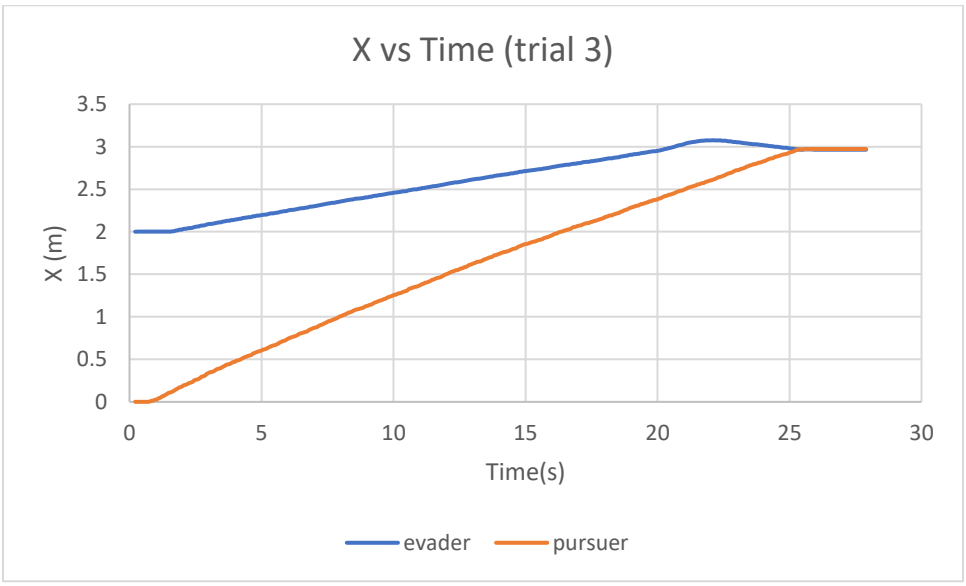
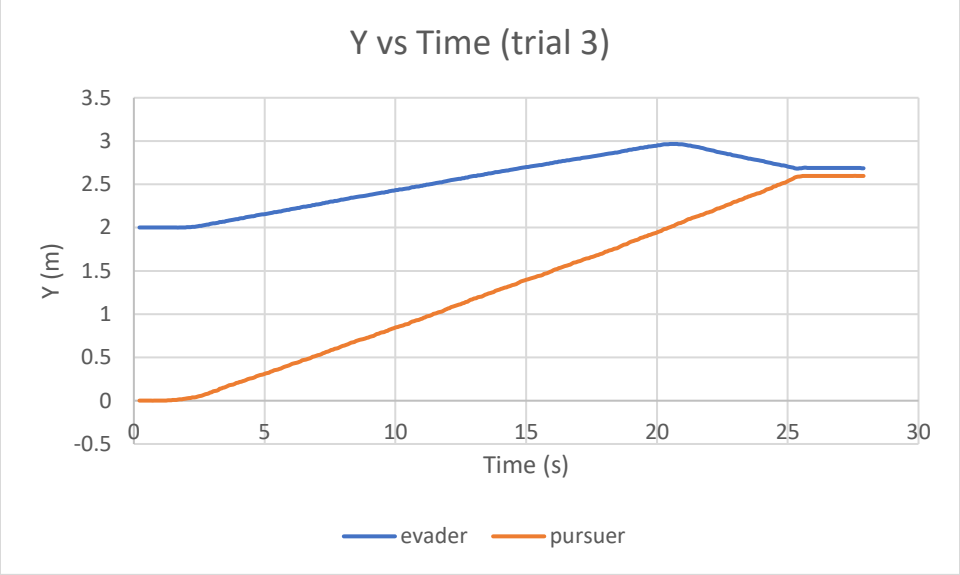
Trial 3:





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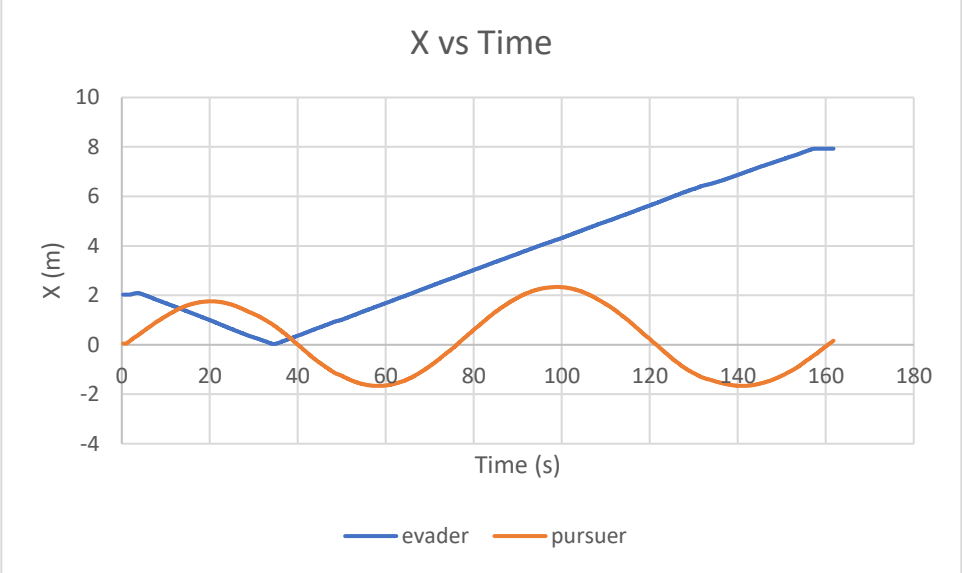
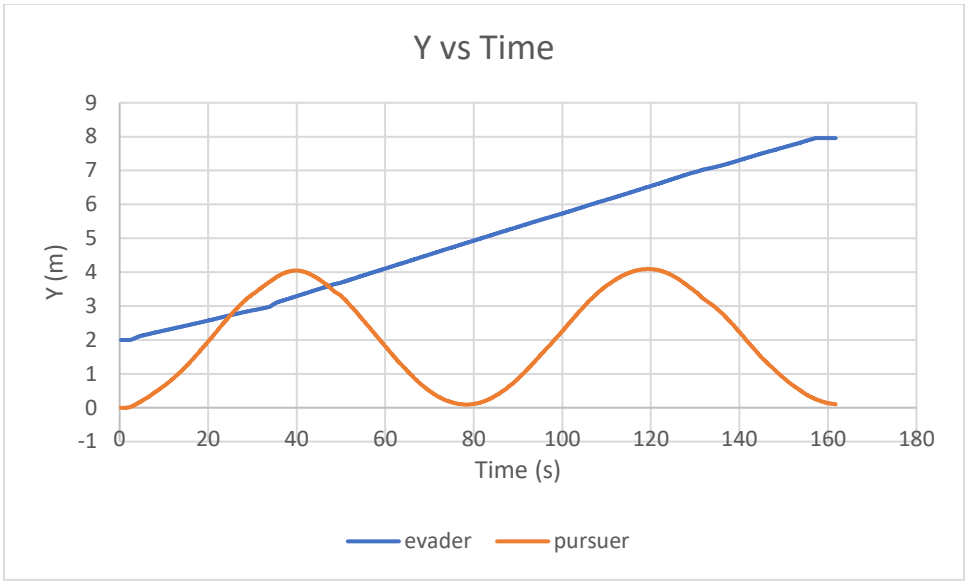
Problem 4:

Using an evader with a maximum speed of 0.1 m/s (and your own pursuer of 0.2 m/s) and a starting location of (3,3) and a goal location of (8,8), create an evader that can out-maneuver your pursuer (pursuer starts at (0,0).





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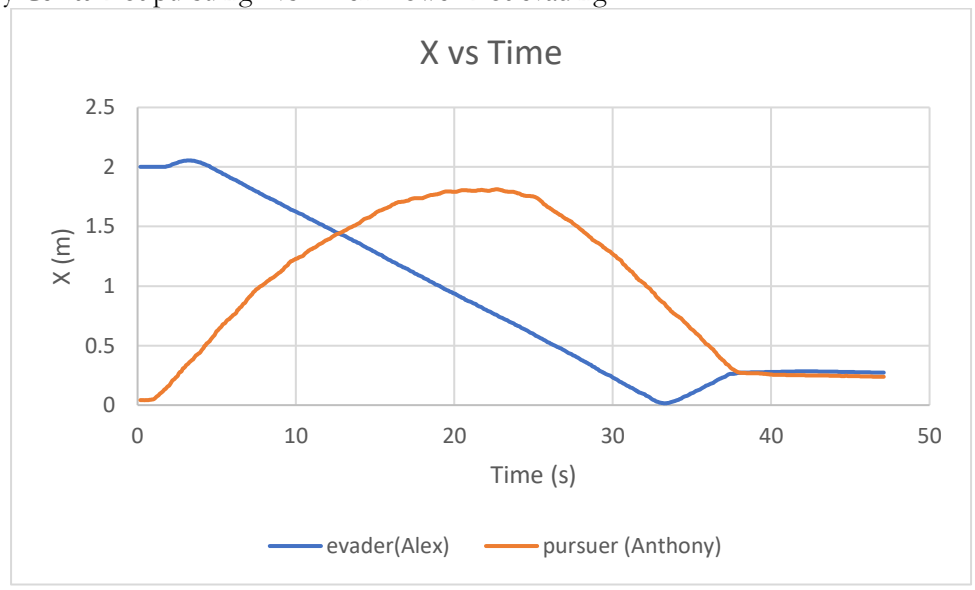
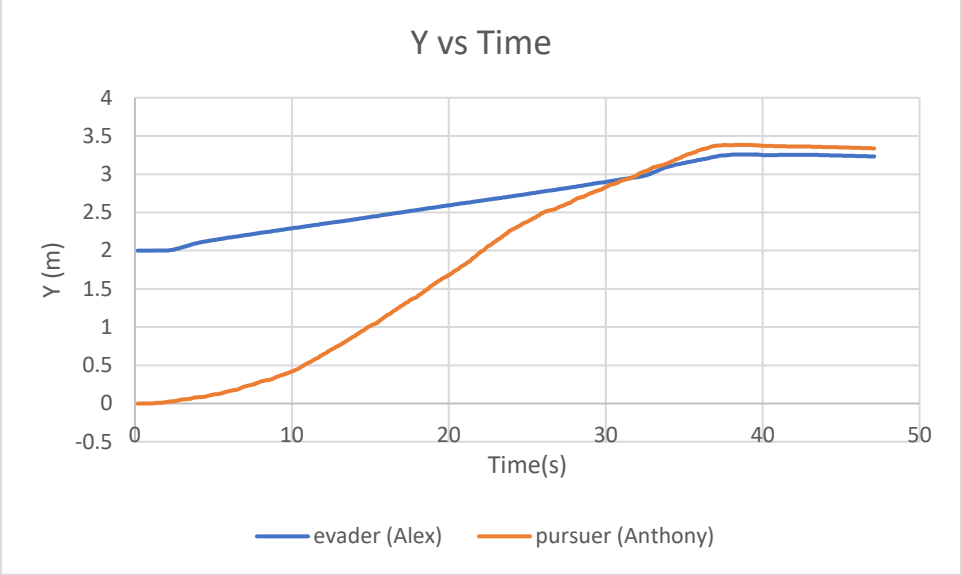
Problem 5:

Work with a partner to test your evader and pursuer (take turns) identical to Problem 4. You can accomplish this through sharing scripts or by connecting two machines in ROS. See the link below for a quick tutorial on how to do this (quite easy).
Show plots of your pursuer and evader.

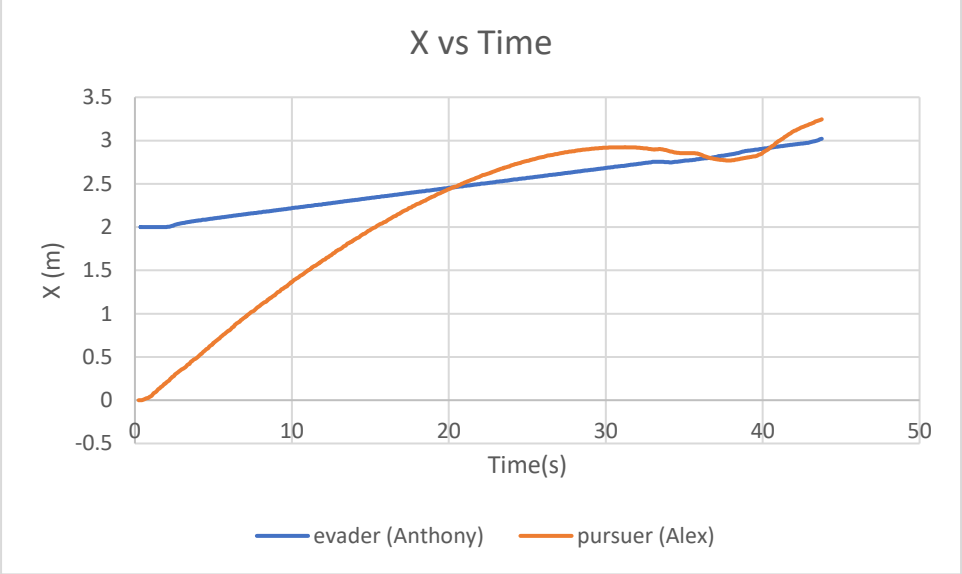
Anthony Cellitti Bot pursuing vs Alex Dowell Bot evading:

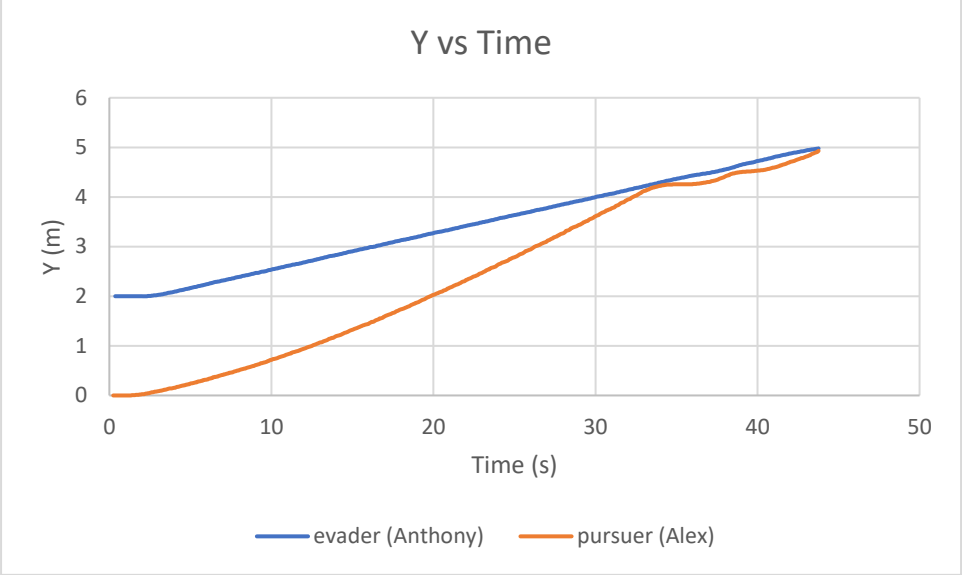




Anthony Cellitti Bot pursuing WINS

Anthony Cellitti Bot evading vs Alex Dowell Bot pursuing:





Alex Dowell Bot pursuing WINS!