## ENPM 808A – Introduction to Machine Learning

### Homework – 4

1.

2. For code, please see the zip file attached.

Number of positive points = 12

In-Sample Error = 0.0

SVM Margin = 0.0863479230977428

Out-of-Sample Error = 0.03

Number of positive points: 12

Number of negatives points: 8

Final correctness: 20 . Total iteration: 4

Final w: [ 0. -0.13341334 1.98459846]

Out-of-Sample Error = 0.03

Chart, scatter chart

Description automatically generated Chart, scatter chart

Description automatically generated

Picked one positive point on the left and one negative on the right lower corner of the plot, so their perpendicular bisector separating plane is a bad separator. We need put them at the end of the points so the PLA algo will have no chance to adjust the separating line using other points. In this case, it took 4 iterations to make PLA converge. It's clear that PLA can be greatly affected by the ordering of data points, while SVM is stable with respect to the point orders. The out-of-sample error is much larger from PLA.

3.

4.

5.