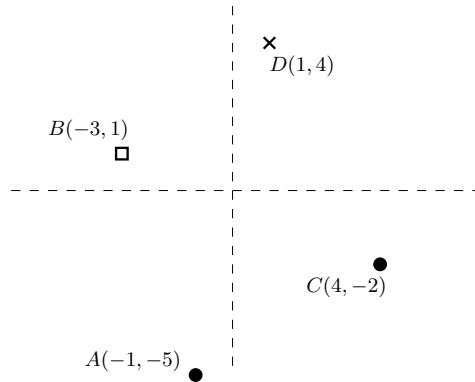


## CMSC5724: Exercise List 7

**Problem 1.** Consider the training set  $P$  of points shown below:



where the two dots have label 1, the cross has label 2, and the box has label 3. Run multiclass Perceptron to find a generalized linear classifier to separate  $P$ .

**Problem 2.** Calculate the margin of the classifier you obtained in the previous problem.

**Problem 3.** Suppose we run multiclass Perceptron on  $k = 2$ . Let  $\{\vec{w}_1, \vec{w}_2\}$  be the set of weight vectors returned. Prove:  $\vec{w}_1 = -\vec{w}_2$ .

**Problem 4.** Continuing on Problem 3, prove: the “margin” of  $W = \{\vec{w}_1, \vec{w}_2\}$  as defined in multiclass Perceptron is precisely the “margin” as defined in (the traditional) Perceptron (i.e., the smallest distance from a point in the training set  $P$  to the separation plane).