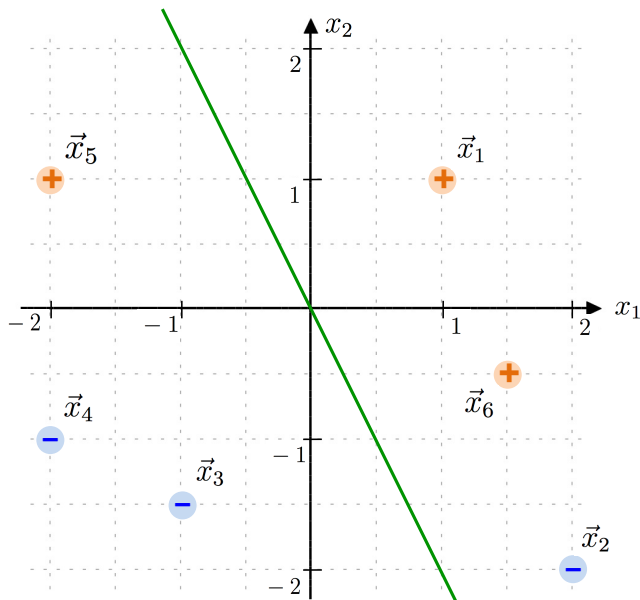


**Perceptron Example**

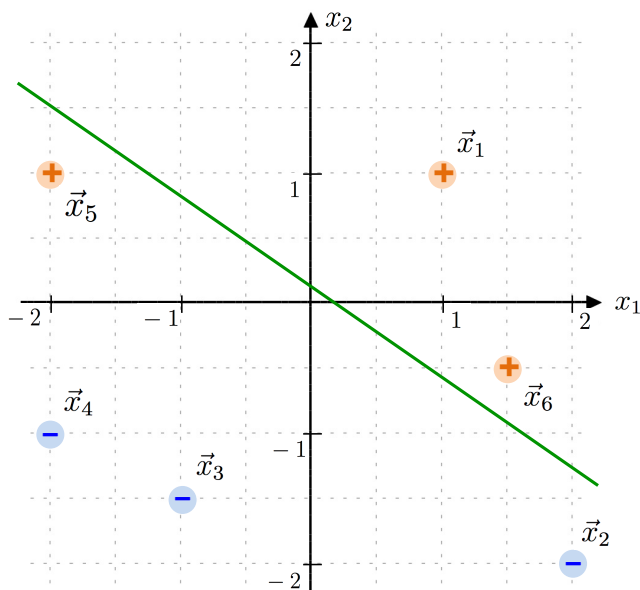
*(find and work with a partner)*

The example below shows 6 training data points. We wish to find a separating hyperplane using the perceptron algorithm. We will begin with  $\vec{w} = [0, 1, 0.5]^T$  and  $\alpha = 0.2$ . We normally use  $\alpha = 1$  so we don't even need to consider it ( $\alpha$  only affects the magnitude of  $\vec{w}$ , not the classifications), but using a small value here will keep the numbers and graphing more manageable.

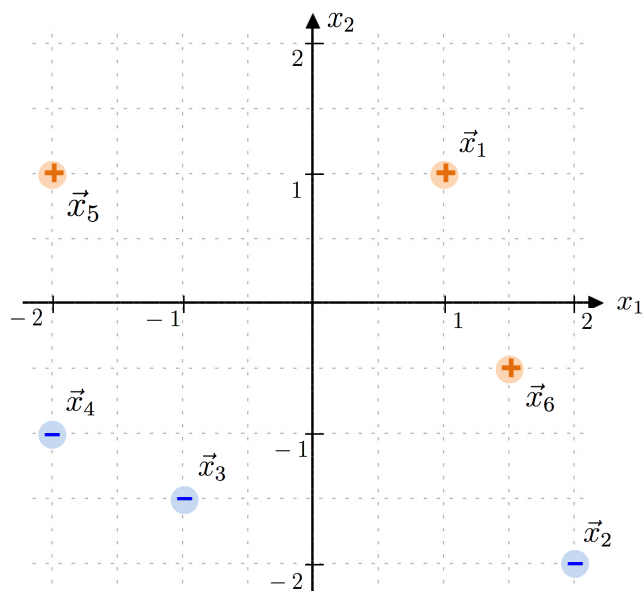
1. Beginning with the plot below, consider the points in order. From  $\vec{x}_1$  and  $\vec{x}_2$ , determine what actions we will take and update the weight vector. Graphically show how the hyperplane is updated.



2. This is what the hyperplane looks like after  $\vec{x}_1$  and  $\vec{x}_2$ . Now consider  $\vec{x}_3$ ,  $\vec{x}_4$ , and  $\vec{x}_5$ . What is the weight vector after these points are considered? Sketch out the vector addition on this plot too.



3. Draw the resulting hyperplane from your previous step. Now consider  $\vec{x}_6$  and update the weight vector using this point.



4. Finally, draw the final hyperplane!

