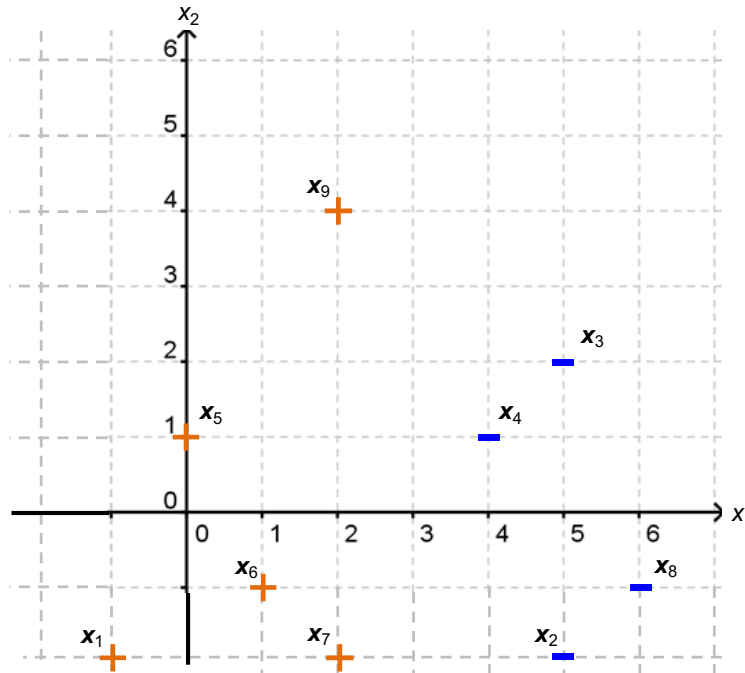


**SVM Optimization Practice**

*(find and work with a partner)*

1. *Incremental SVM optimization algorithm.* Let  $K = 4$  (initial dataset size). We will iteratively add points in order of their indices (not randomly). Run the incremental SVM optimization algorithm – at each stage, write out  $S$ , the support vectors, and which  $\alpha$  values end up being 0. At the end, what is the equation of the separating hyperplane?



Round 1:

- $S =$
- Support vectors:
- $\alpha$ 's that are 0:

Round 2:

- $S =$
- Support vectors:
- $\alpha$ 's that are 0:

Round 3:

- $S =$
- Support vectors:
- $\alpha$ 's that are 0:

Round 4:

- $S =$
- Support vectors:
- $\alpha$ 's that are 0:

2. *Coordinate descent/ascent example.* Here we will try to *minimize* the function of two variables  $f(x, y) = 5x^2 - 6xy + 5y^2$  (correction!) Initially, let  $x = -1$  and  $y = -1$ . First, fix  $y$  and minimize the function with respect to  $x$  by taking the derivative. Then use that value to fix  $x$  and minimize the function with respect to  $y$  (you only need to do two iterations). What is the actual solution in this case?