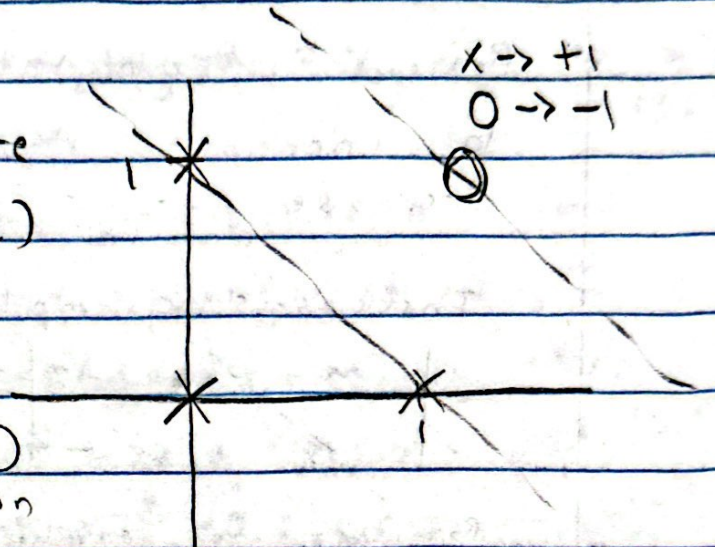


Spring - 2017 Final

Q3] SVM

a) please refer to midterm solution for dual formulation (spring 2016 midterm-1)

b) Therefore,  
Support vectors are  
(0, 1), (1, 0), (1, 1)



$$\therefore d_1 = 0$$

$$d_4 = d_2 + d_3 \quad \text{--- (1)}$$

↳ dual form condition

Dual form

$$\Rightarrow d_2^2 (1, 0 \cdot 1, 1, 0, 1) + d_3^2 (1, 0, 1, 1 \cdot 1, 0, 1) \\ + d_4^2 (1, 1, 1) \cdot (1, 1, 1) + 2 d_2 d_3 (1, 1, 0, 1 \cdot 1, 0, 1) \\ - 2 d_2 d_4 (1, 1, 1 \cdot 1, 0, 1) - 2 d_3 d_4 (1, 1, 1 \cdot 1, 1, 0, 1) \\ + d_2 + d_3 + d_4$$

$$\Rightarrow L(d) = d_2^2 + d_3^2 + 2 d_4^2 - 2 d_2 d_4 - 2 d_3 d_4 + d_2 + d_3 + d_4$$

$$\frac{\partial L(d)}{\partial d_2} \Rightarrow 2 d_2 - 2 d_4 + 1 = 0$$

$$d_4 = d_2 + \frac{1}{2} \quad \text{--- (2)}$$

$$\frac{\partial L(d)}{\partial d_4} = 0$$

$$d_4 = d_2 + \frac{1}{2}$$

$$\text{Similarly, } \frac{\partial L(d)}{\partial d_3} = 0, \quad d_4 = d_3 + \frac{1}{2} \quad \text{--- (3)}$$

$$\text{Solve (1), (2), (3)} \quad d_2 = \frac{1}{2}, \quad d_3 = \frac{1}{2}, \quad d_4 = 1$$