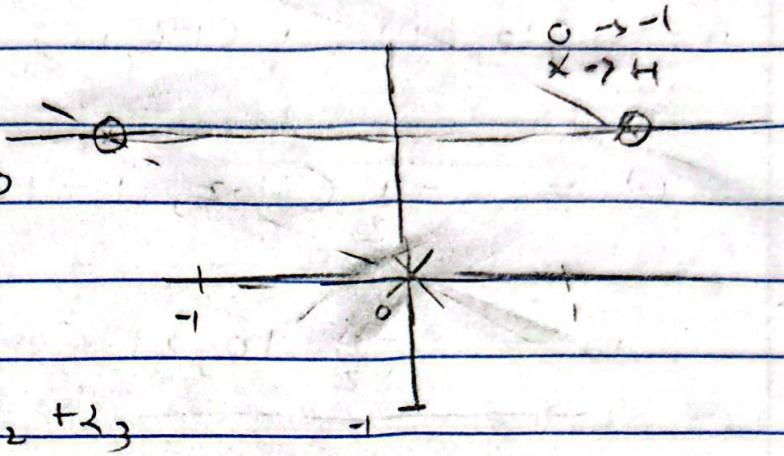
*spring 2016 midterm-1

Q4] SVM

Use dual



$\Rightarrow \alpha_1 - \alpha_2 - \alpha_3 = 0$

$\alpha_1 = \alpha_2 + \alpha_3$

$\Rightarrow L(\alpha) = \alpha_1 + \alpha_2 + \alpha_3$

$-\frac{1}{2}\{ \alpha_1^2 \times 0 + \alpha_2^2 (1-2,1 \cdot 1-2,1) + \alpha_3^2$

$(1 2,1 1 - 1 2,1 1) - 2\alpha_1\alpha_2 \times 0 - 2\alpha_1\alpha_3 \times 0$

$+ 2\alpha_2\alpha_3 (1-2,1 1 \cdot 1 2,1 1)$

$\Rightarrow L(\alpha) = \alpha_1 + \alpha_2 + \alpha_3 - \frac{1}{2}(5\alpha_2^2 + 5\alpha_3^2$

$-6\alpha_2\alpha_3)$

$\frac{\partial L(\alpha)}{\partial \alpha_2} = 1 - 5\alpha_2 + 3\alpha_3 = 0$

$\frac{\partial L(\alpha)}{\partial \alpha_3} = 1 - 5\alpha_3 + 3\alpha_2 = 0$

$\alpha_2 = \frac{1 + 3\alpha_3}{5}$

$\Rightarrow 1 - 5\alpha_3 + \frac{3 + 9\alpha_3}{5} = 0$

$\Rightarrow 5 - 25\alpha_3 + 3 + 9\alpha_3 = 0$

$\alpha_3 = \frac{1}{2}$, $\alpha_2 = \frac{1 + 3/2}{5} = \frac{1}{2}$, $\alpha_1 = 1$

$$w = \sum_{i=1}^{3} \alpha_i y_i x_i$$

$$w = 1(1,0,0,1) - \frac{1}{2}(1-2,1,1) - \frac{1}{2}(1,2,1,1)$$

$$w = -\frac{1}{2}(1-2,1,1 + 1,3,1,1)$$

$$w = -\frac{1}{2}\,1\,0,2\,1$$

$$w = 1\,0,-1\,1$$

$$1(w\,1-2,1,1 + b) = 1$$

$$b = \frac{1}{2}$$

$$w = 1\,0,-1\,1 \;,\; b = 2$$

~~A~~ which is basically

$y = 1/2$ line