b - maximum margine = 1

Q2 :- $\langle \vec{x}, \vec{y} \rangle$ $R^2 \times R_2 \longrightarrow R$

$\langle \vec{x}, \vec{y} \rangle = \underline{x_i y_i + x_j y_j}$

is a Kernal

$y = \Theta^T x$

$K_1 = \langle \vec{x}, \vec{y} \rangle$

$K = (K_1 + 1)^2$ is also Kernal because ~~(K1+1)^2~~

$(x+1)^2$ is polynomyal with positive ~~cofe~~ coefficents

let's find the function ϕ

$$K = (x_i y_i + x_j y_j + 1)^2$$

$$= (x_i y_i + x_j y_j + 1)(x_i y_i + x_j y_j + 1)$$

$$= (x_i y_i)^2 + x_i y_i x_j y_j + x_i y_i + x_i y_i x_j y_j + (x_j y_j)^2$$

$$+ x_j y_j + x_i y_i + x_j y_j + 1$$

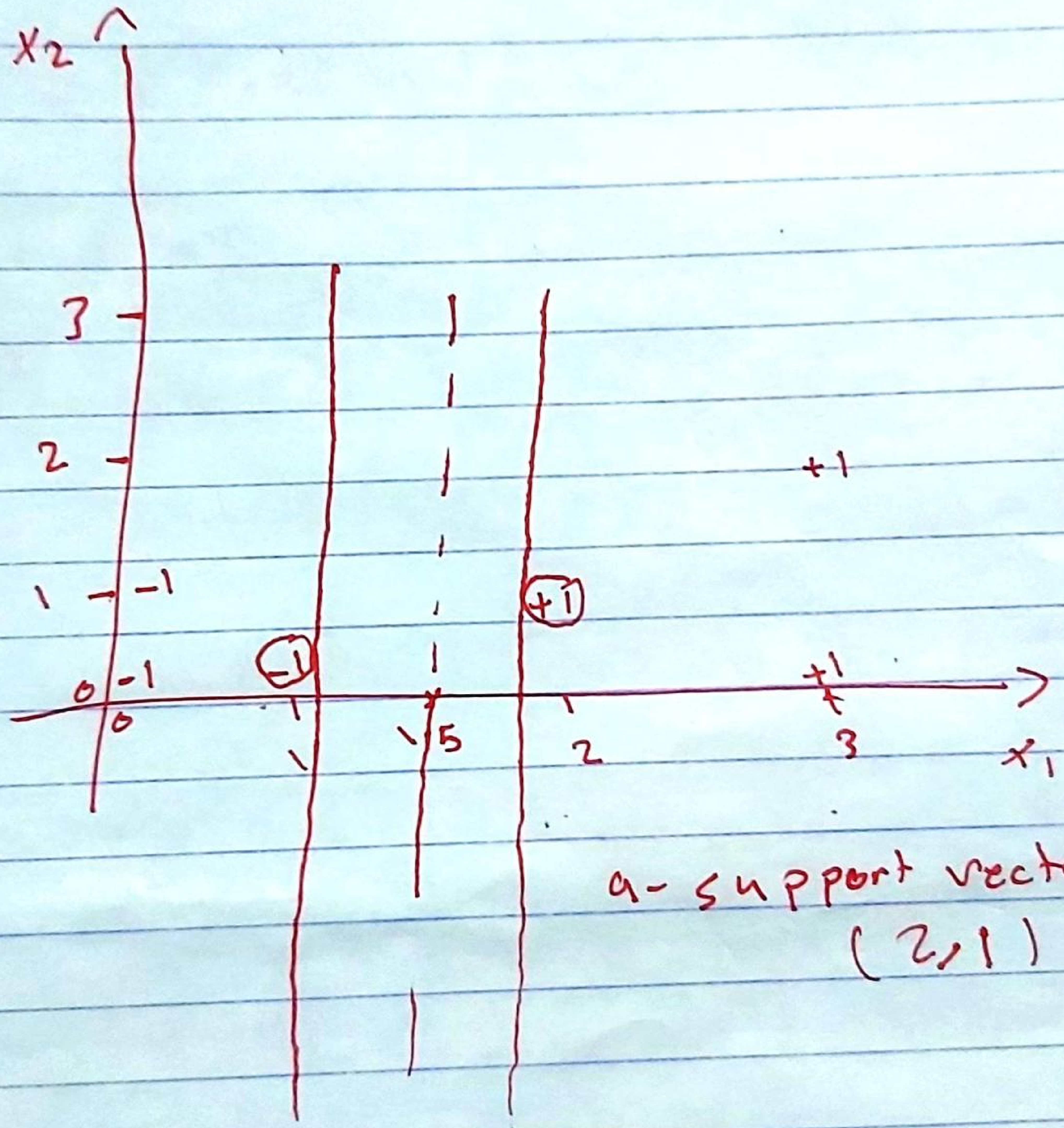
$$= (x_i y_i)^2 + (x_j y_j)^2 + 2 x_i y_i x_j y_j + 2 x_i y_i + 2 x_j y_j + 1$$

$$\phi_x = (x_i^2, x_j^2, \sqrt{2}\, x_i x_j, \sqrt{2}\, x_i, \sqrt{2}\, x_j, 1)$$

$$\phi_y = (y_i^2, y_j^2, \sqrt{2}\, y_i y_j, \sqrt{2}\, y_i, \sqrt{2}\, y_j, 1)$$

$$\phi = (z_i^2, z_j^2, \sqrt{2}\, z_i z_j, \sqrt{2}\, z_i, \sqrt{2}\, z_j, 1)$$

Q3 :-



a- support vectors :-
(2,1) , (1,0)

b- maximum margine = 1