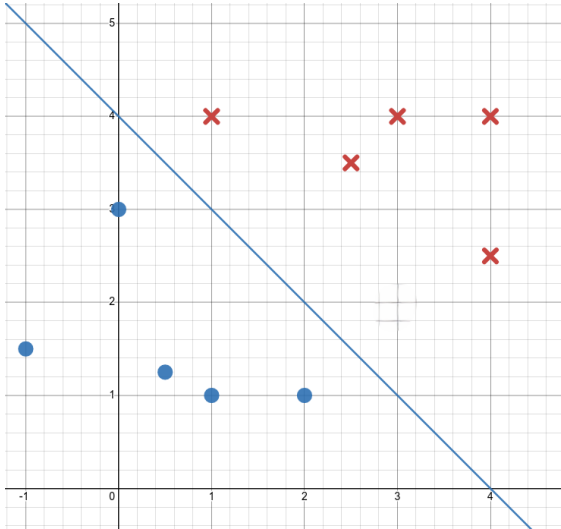

CMSE381 - Quiz 12

1. (5pts) The equation of the classifier (the blue line) is given as

$$-2\sqrt{2} + \frac{\sqrt{2}}{2}X_1 + \frac{\sqrt{2}}{2}X_2 = 0 \rightarrow g(x)$$

Please find the inner product expression of this line in the form of $f(x) = \beta + \sum_i \alpha_i \langle x, x_i \rangle$.



No unique sol.

full credits as long as the found $f(x)$ equals to $g(x)$ or $-g(x)$.

One possible sol is constructing $f(x)$ using the support vectors (1, 4) and (0, 3)

$$\begin{aligned} f(x) \equiv f\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) &= -2\sqrt{2} + d_1 \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 4 \end{pmatrix} + d_2 \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ 3 \end{pmatrix} \\ &= -2\sqrt{2} + d_1 x_1 + (4d_1 + 3d_2) x_2 = -2\sqrt{2} + \frac{\sqrt{2}}{2} x_1 + \frac{\sqrt{2}}{2} x_2 \end{aligned}$$

2. (5pts) If the input of the softmax function is (1, 4, 2, -2), what is corresponding output?

$$\text{Let } a = e^1 + e^4 + e^2 + e^{-2}$$

$$\text{output} = \left(\frac{e^1}{a}, \frac{e^4}{a}, \frac{e^2}{a}, \frac{e^{-2}}{a} \right)$$

$$\begin{aligned} d_1 &= \frac{\sqrt{2}}{2} \\ d_2 &= -\frac{\sqrt{2}}{2} \end{aligned}$$