# Note
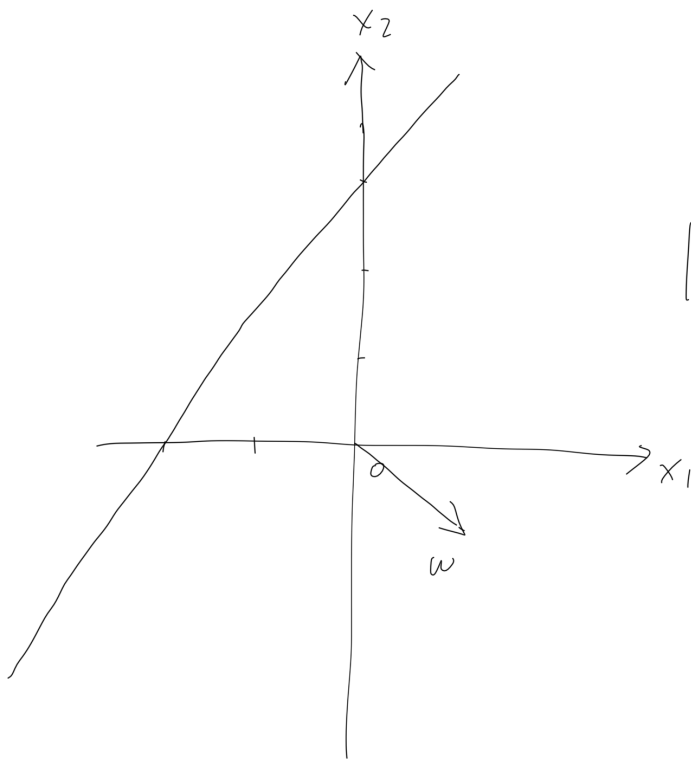
## Chen, Feng

Wed 2/24/2016 2:20 PM

To: Chen, Feng <fchen5@albany.edu>;
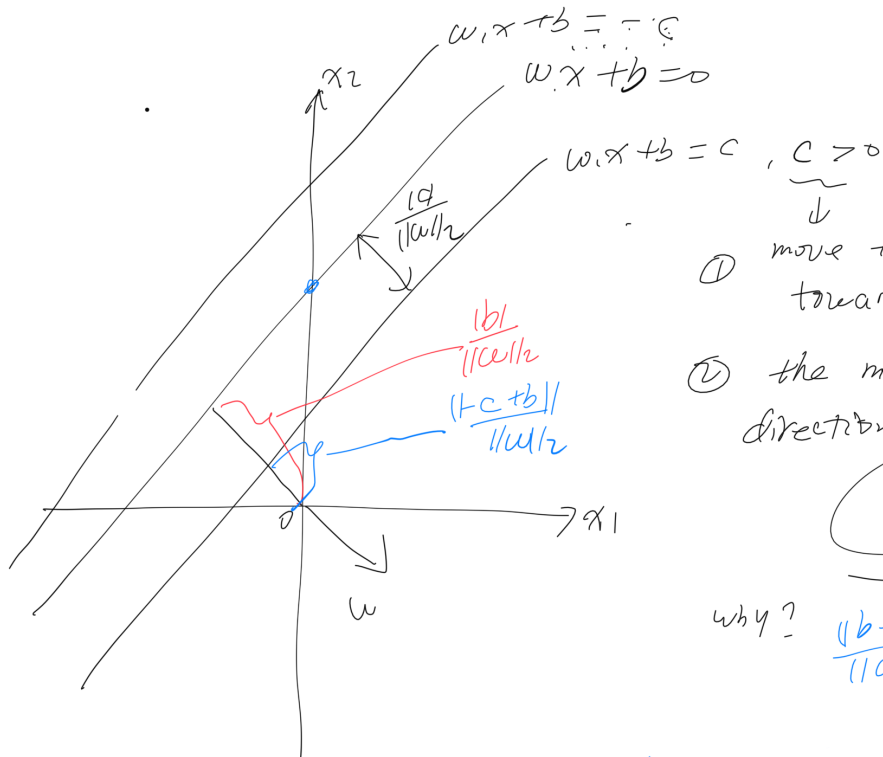
$$\text{①} \quad x_2 = m \cdot x_1 + b$$

$$\text{②} \quad x = x^\circ + \lambda \cdot v \,, \quad x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\boxed{\text{③} \quad x \cdot w + b = 0}$$

$$\Downarrow$$

A. $w$ is perpendicular to the line

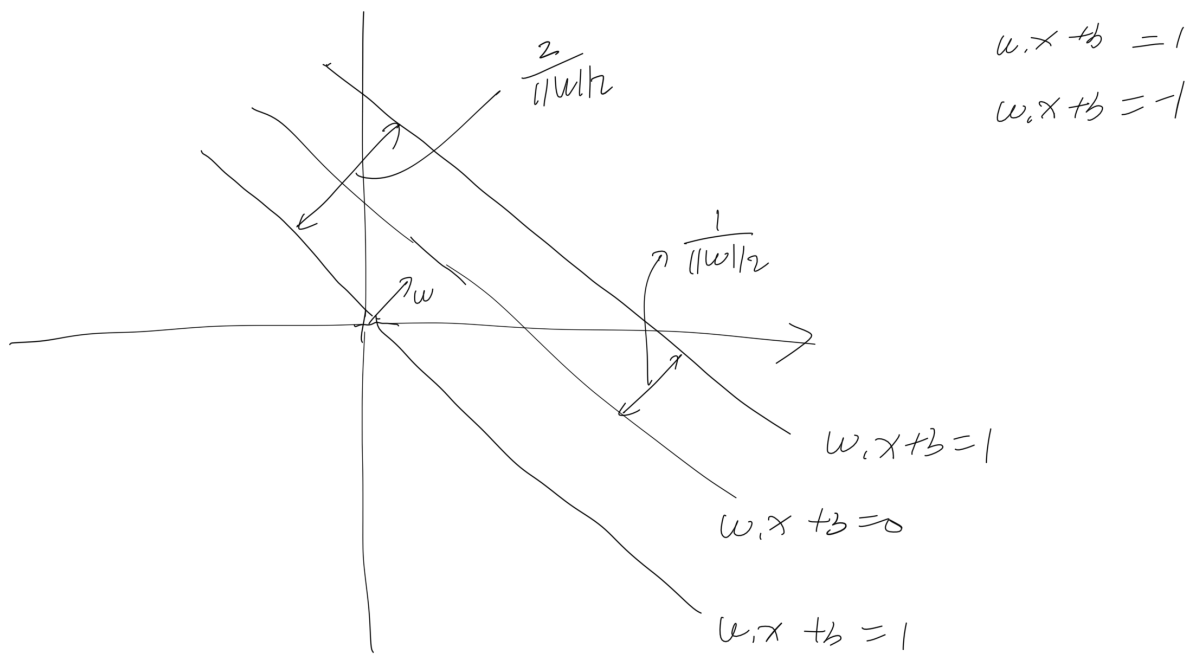B. $\dfrac{|b|}{\|w\|_2}$ is the distance from the line to the origin.

$w_1 x + b = -c$

$w \cdot x + b = 0$

$w_1 x + b = c \ , \ c > 0$

$\dfrac{|c|}{\|w\|_2}$

$\dfrac{|b|}{\|w\|_2}$

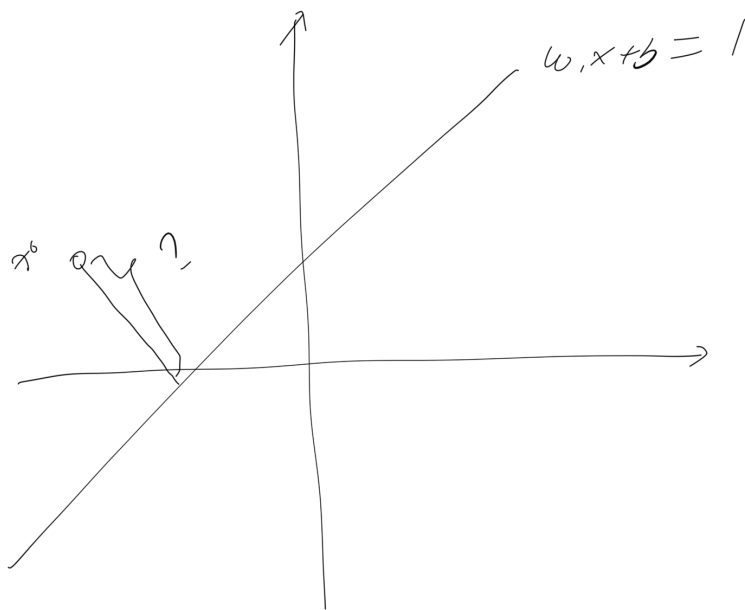$\dfrac{|-c+b|}{\|w\|_2}$

$x_2$

$x_1$

$w$

① move the line in parallel ~~the~~ towards ~~to~~ the direction of $w$.

② the moved distance along the direction of $w$ is

$$\boxed{\dfrac{|c|}{\|w\|_2}}$$

why? $\dfrac{|b-c|}{\|w\|_2} - \dfrac{|b|}{\|w\|_2} = \dfrac{|c|}{\|w\|_2}$

$$\frac{2}{\|w\|_2}$$

$$\frac{1}{\|w\|_2}$$

$$w$$

$$w \cdot x + b = 1$$

$$w \cdot x + b = -1$$

$$w, x + b = 1$$

$$w, x + b = 0$$

$$w, x + b = 1$$

$$w, x + b = 1$$

$x^b$   $\alpha$   $\gamma$

$? \longrightarrow \langle w, x \rangle + b = \langle w, x^0 \rangle + b \longrightarrow$

$\langle w, x \rangle + b = c$
$\langle w, x^0 \rangle + b = c$ $\Big\}$ $\Rightarrow$ $c$
$= \langle w, x^0 \rangle + b$

$\langle w_i x \rangle + b = 0$

$\Downarrow$

$\langle w, x \rangle + b = \langle w, x^0 \rangle + b$

$x^0$

$\dfrac{\langle w, x^0 \rangle + b}{\|w\|_2}$

$x_2$

$0$

$\rightarrow x_1$
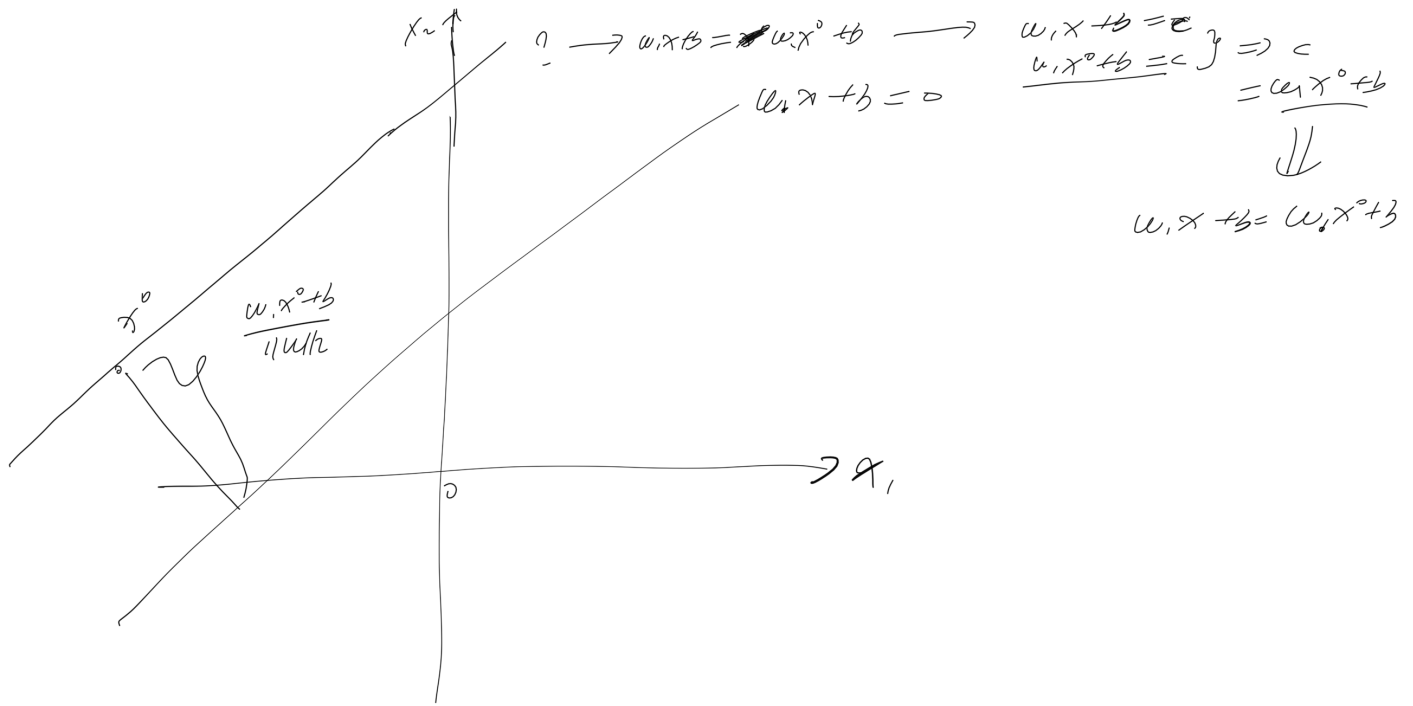
$$x_2 = w \cdot x_1 + b$$

$$x = x^0 + \lambda \cdot v \ , \quad x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$w \cdot x + b = 0$$

$\Downarrow$

$w \cdot x + b = 0$

$w$ is perpendicular to the line

$\frac{|b|}{\|w\|_2}$ is the distance from the line to the origin

$\Downarrow$

parallel lines

$$w \cdot x + b = 0$$

$$w \cdot x + b = \pm c \ , \ c > 0$$

→ move towards the direction of $w$

→ move towards the reverse direction of $w$

move distance: $\dfrac{|c|}{\|w\|_2}$

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separating line given three points

$$\left. \begin{array}{l} w \cdot x^1 + b = 1 \\ w \cdot x^2 + b = -1 \\ w \cdot x^3 + b = 1 \end{array} \right\} \Rightarrow \underbrace{w, b}_{\Downarrow}$$

$\boxed{w \cdot x + b = 0}$

$\Uparrow$

distance of a point $x^0$ & a line $w \cdot x + b = 0$

$\forall x^0$, the distance is $\dfrac{|w \cdot x^0 + b|}{\|w\|_2}$

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