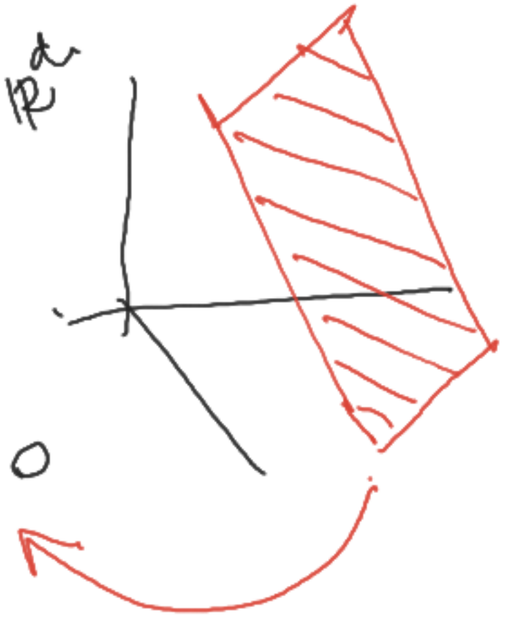
$x = (x_1, x_2, \dots, x_d) \in \mathbb{R}^d$

$w = (w_1, w_2, \dots, w_d)$

$x \cdot w = w_1 x_1 + w_2 x_2 + \dots + w_d x_d$

$w_0 + x \cdot w = w_0 + w_1 x_1 + \dots + w_d x_d = 0$

$$w_0 + w \cdot x = 0$$



Encontrar el valor de $w_2, w_1, \dots, w_d$.

$x = (x_1, x_2, \dots, x_d) \in \mathbb{R}^d \longrightarrow x = (1, x_1, x_2, \dots, x_d) \in \mathbb{R}^{d+1}$

$w = (w_0, w_1, \dots, w_d) \in \mathbb{R}^{d+1}$

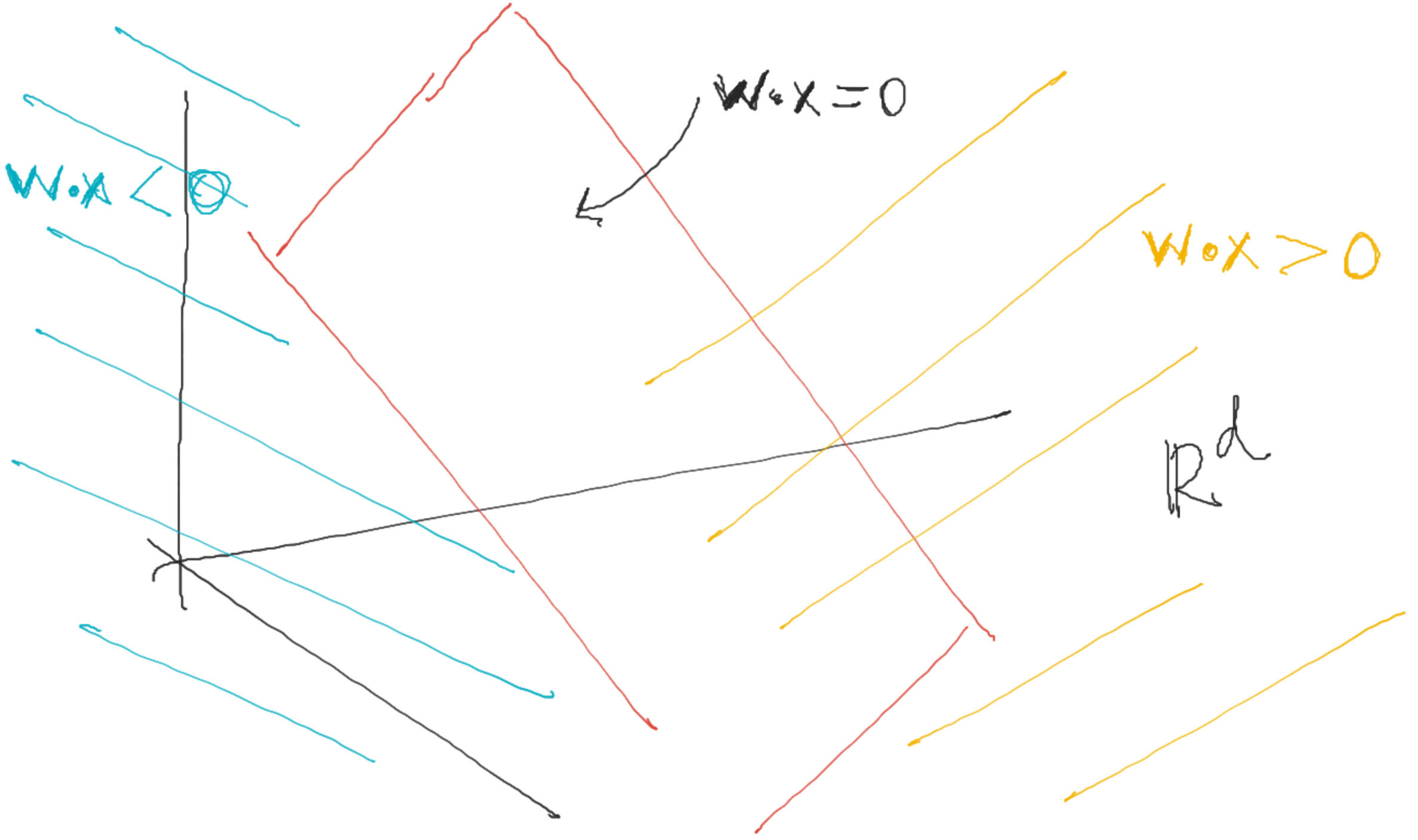
$$w \cdot x = 0$$

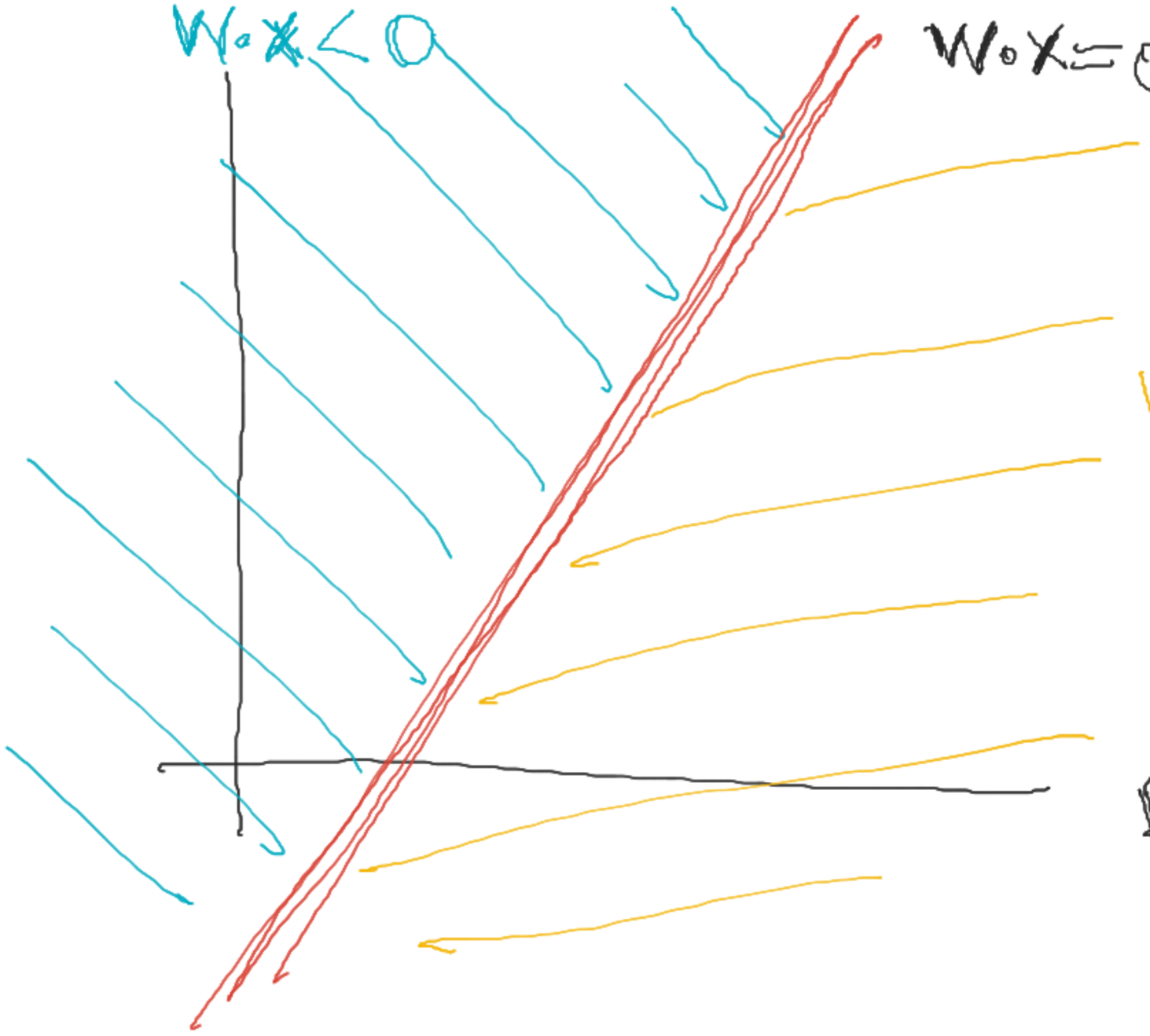
$w^T x = w \cdot x$

$$x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_d \end{bmatrix} \in \mathbb{R}^d \qquad w^T x = \begin{bmatrix} w_1 & \cdots & w_d \end{bmatrix} \begin{bmatrix} x_1 \\ \vdots \\ x_d \end{bmatrix}$$

$d \times 1$

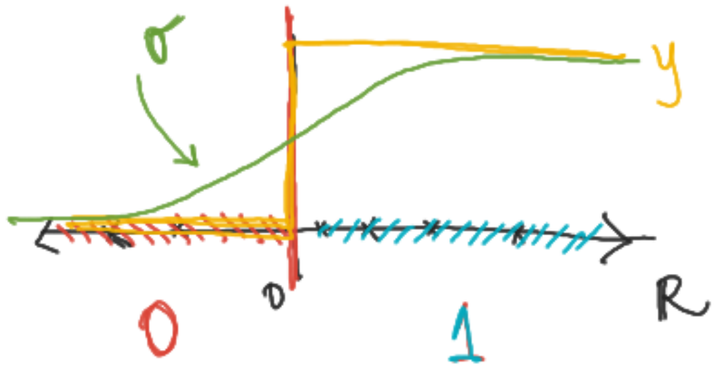
$$= w_1 x_1 + w_2 x_2 + \cdots + w_d x_d$$


$W \cdot x = 0$
$W \cdot x < 0$
$W \cdot x > 0$
$\mathbb{R}^d$



Data x_i

$y_i = \text{sign}(W \cdot X_i)$



$$y_i = \mathbb{1}(x_i > 0)$$

$x_i > 0 \Rightarrow y_i = 1$

$x_i \leq 0 \Rightarrow y_i = 0$

- σ diferenciable ✓
- σ es una versión suave de ⌊¯

$$x \in \mathbb{R}^d \xrightarrow{w\cdot} w\cdot x \in \mathbb{R} \xrightarrow{\sigma} (0,1)$$

$$\sigma(w\cdot x) = \frac{1}{1+e^{-w\cdot x}}$$

$$= \frac{1}{1+e^{-w_0 - w_1 x_1 - \dots - w_d x_d}}$$

$\sigma(w\cdot x) = P(x \in \text{clase } 1)$.

Reg. Logística

$$y(x_i) = \begin{cases} 0; & \sigma(w\cdot x) < 1/2 \\ 1; & \sigma(w\cdot x) > 1/2 \end{cases}$$