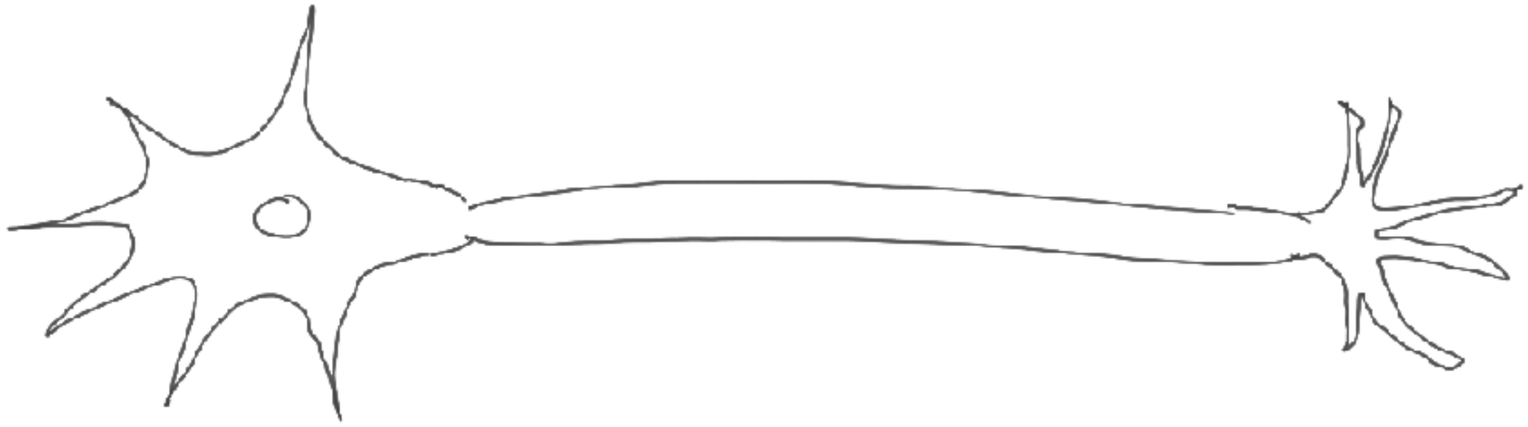
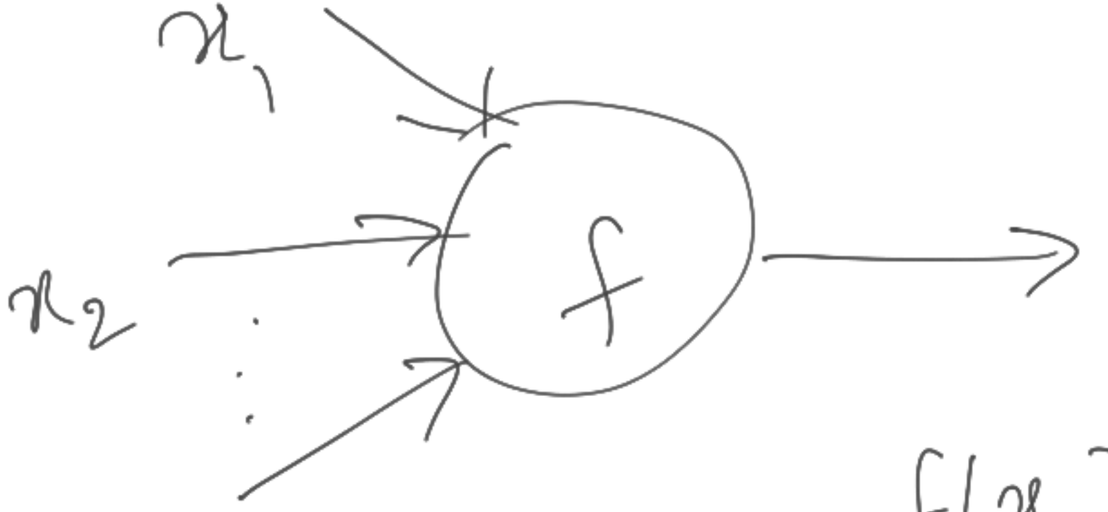




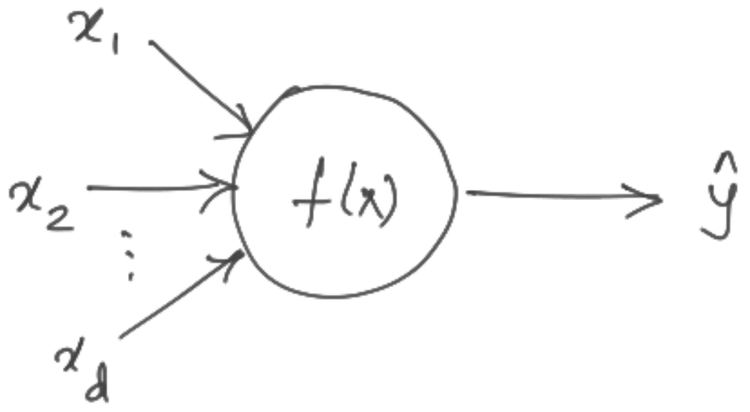
$x \in \mathbb{R}^d$

$y \in \{-1, 1\}$

$$f(\underline{x}) = \hat{y}$$

$$f(x) = \text{sign}\left(\sum_{i=1}^{d} w_i x_i + b\right)$$

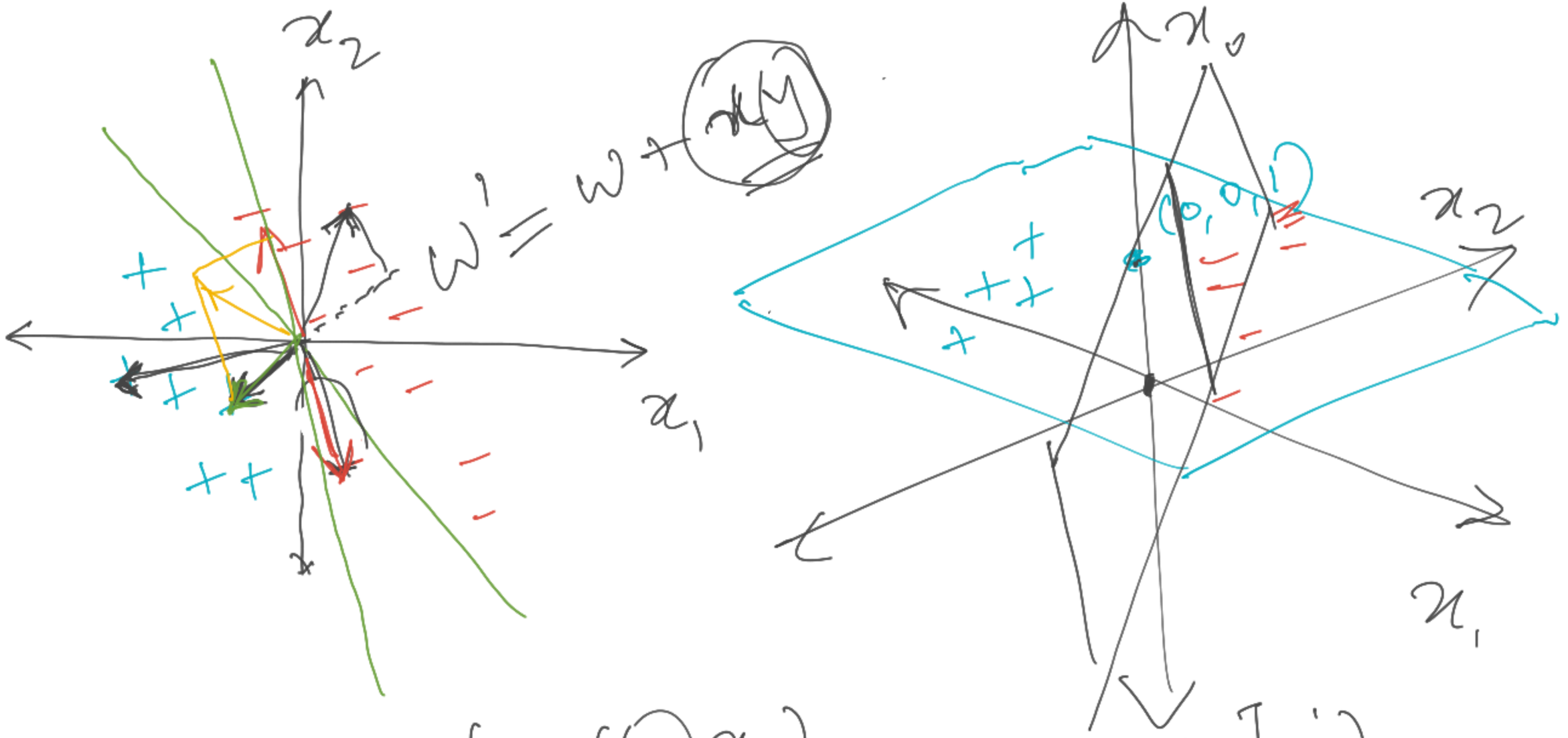
$\underline{\underline{D}} = \{(\underline{x}^{(1)}, y^{(1)}), \dots, (\underline{x}^{(n)}, y^{(n)})\}$



0-1 loss

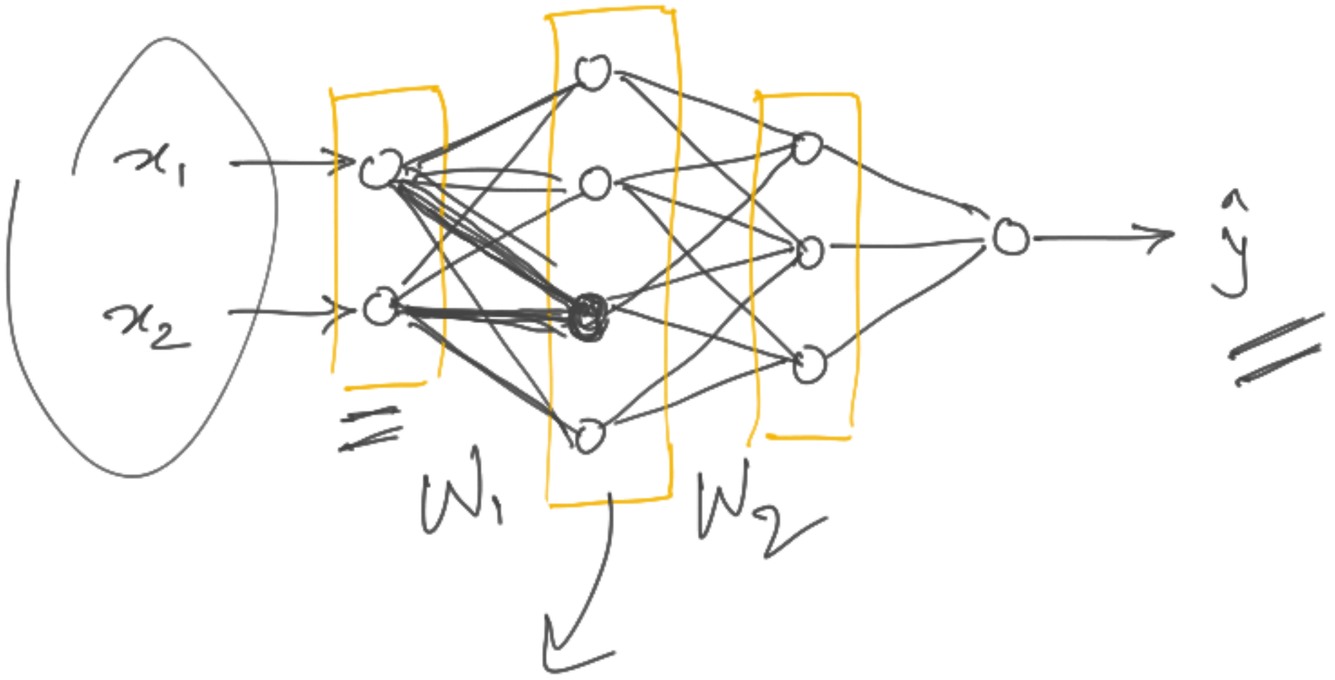
$$\mathcal{L}(\underline{x}, y, f) = \sum_{x^{(i)} \in M} y^{(i)} (w^T \underline{x}^{(i)} + b)$$

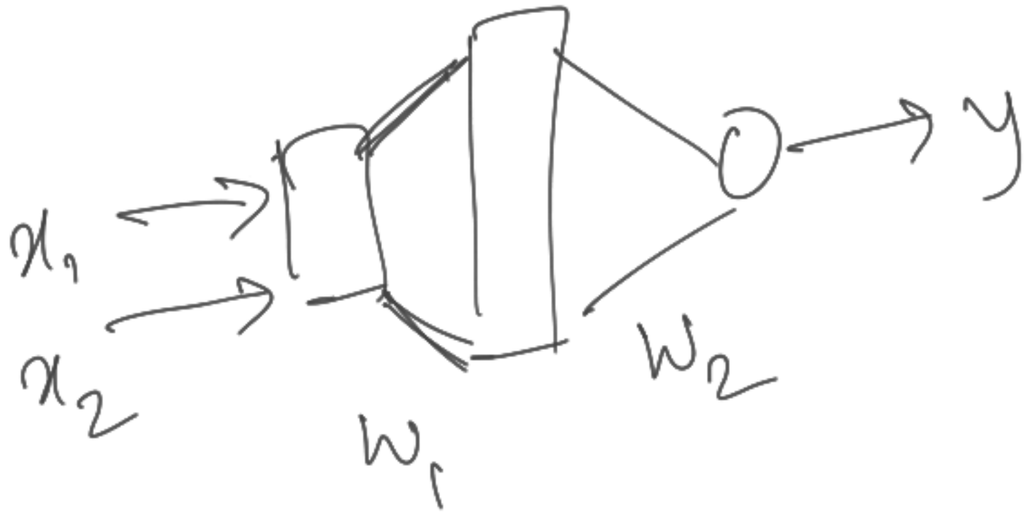
$$w_i = w_i + \eta\, y x_i$$



$x' = ((1), \underline{x})$

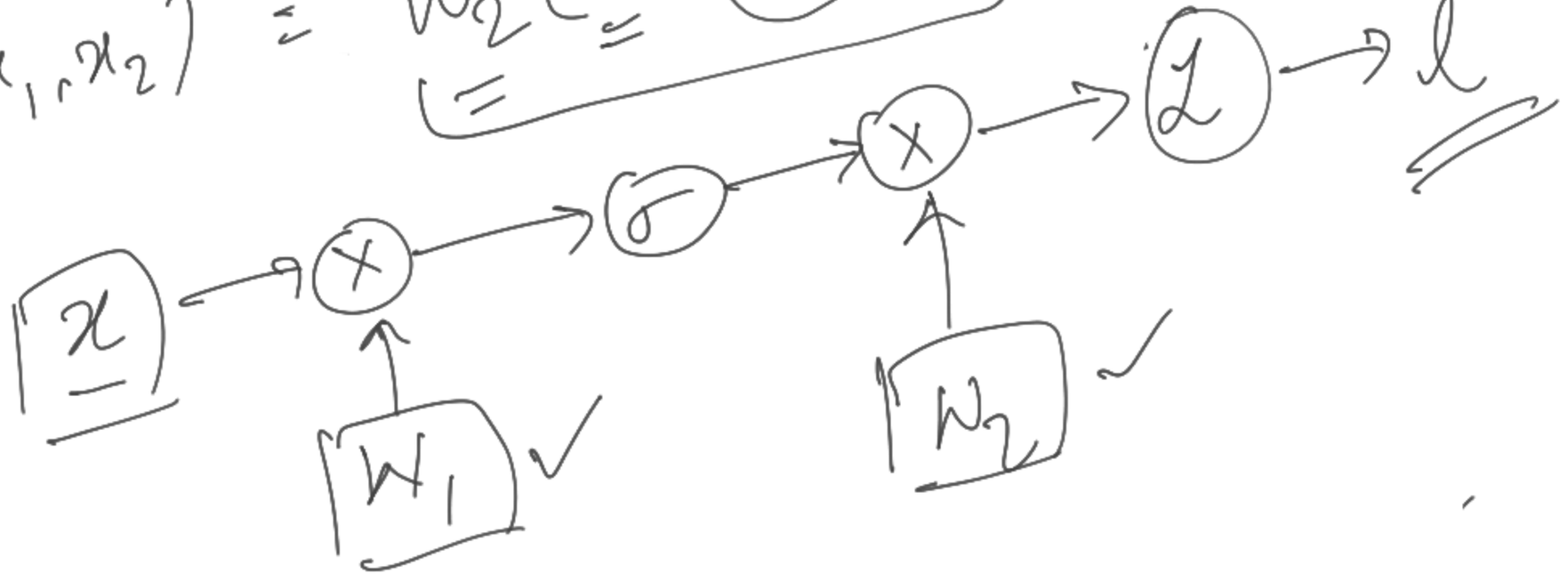
$w' = ((b), \underline{w})$


x_1
x_2
W_1
W_2
$\hat{y}$



$$z_1 = W_1 x$$
$$a_1 = \sigma(z_1)$$
$$z_2 = W_2 a_1 = \hat{y}$$
$$l = \frac{1}{2} \| z_2 - y \|_2^2$$

$$f(x_1, x_2) = \underbrace{W_2 \, l(\sigma(W_1 x))}$$



$$\frac{\partial L}{\partial W_2} = \frac{\partial L}{\partial Z_2} \cdot \frac{\partial Z_2}{\partial W_2}$$

$$\frac{\partial L}{\partial W_1} = \frac{\partial L}{\partial Z_2} \cdot \frac{\partial Z_2}{\partial a_1} \cdot \frac{\partial a_1}{\partial Z_1} \cdot \frac{\partial Z_1}{\partial W_1}$$