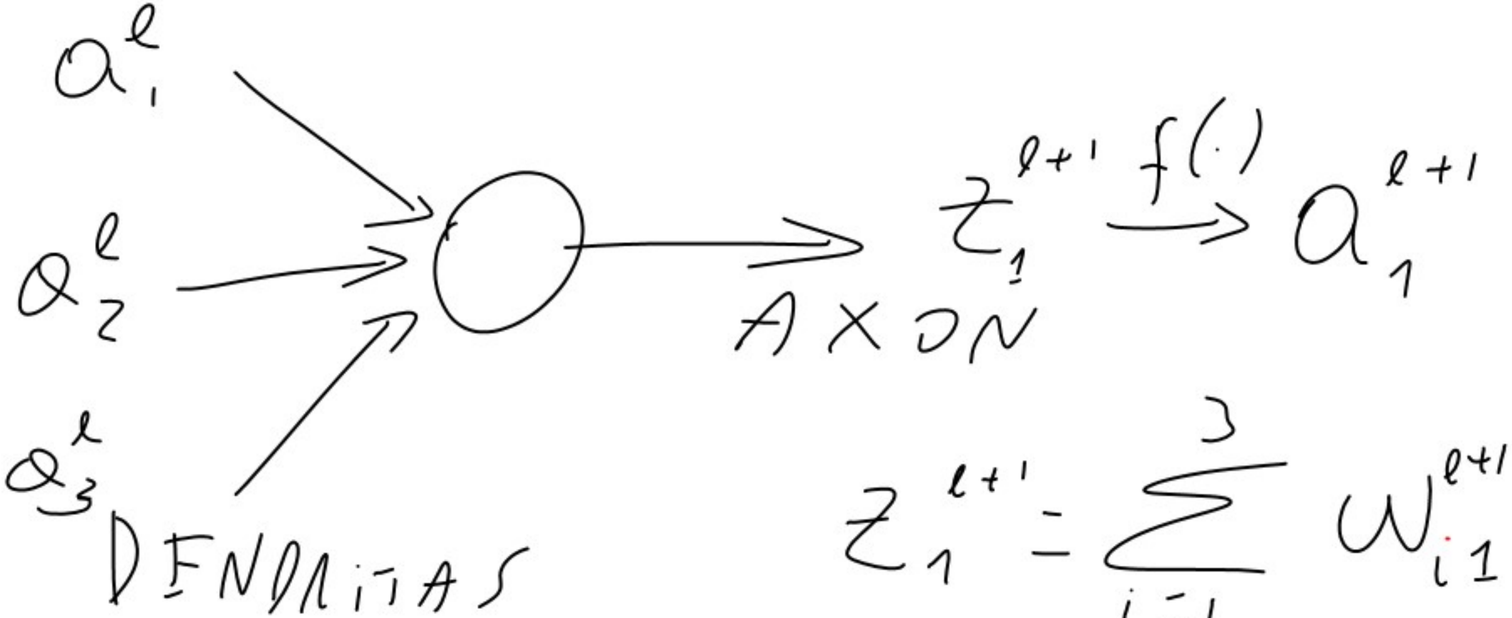
REDES NEURONALES



$$z_1^{l+1} = \sum_{i=1}^{3} w_{i1}^{l+1} a_i^l + b$$

$[w_{ij}^{l+1}]_{n_l \times n_{l+1}}$

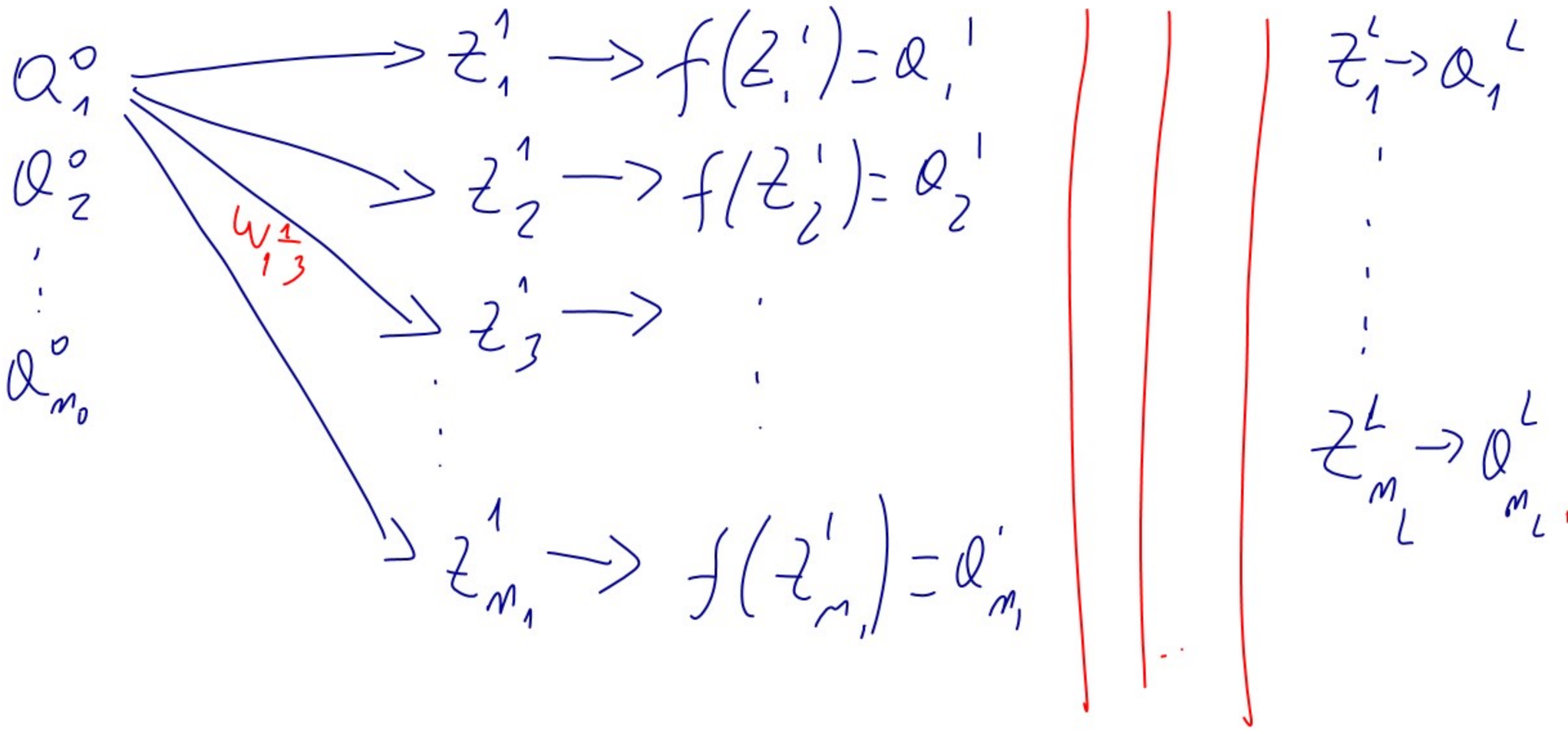
$(1 \times n_{l+1})$

$(1 \times n_l)(n_l \times n_{l+1})$

$$z^{l+1} = a^l w^{l+1} + b^{l+1}$$

$$a^l = \begin{pmatrix} a_1^l \\ a_2^l \\ \vdots \\ a_{n_l}^l \end{pmatrix}^T$$

$$a^{l+1} = \begin{pmatrix} a_1^{l+1} \\ \vdots \\ a_{n_{l+1}}^{l+1} \end{pmatrix}^T$$


a_1^0
a_2^0
$a_{n_0}^0$
w_{13}^1
$z_1^1 \to f(z_1^1) = a_1^1$
$z_2^1 \to f(z_2^1) = a_2^1$
$z_3^1 \to$
$z_{n_1}^1 \to f(z_{n_1}^1) = a_{n_1}^1$
$z_1^L \to a_1^L$
$z_{n_L}^L \to a_{n_L}^L$

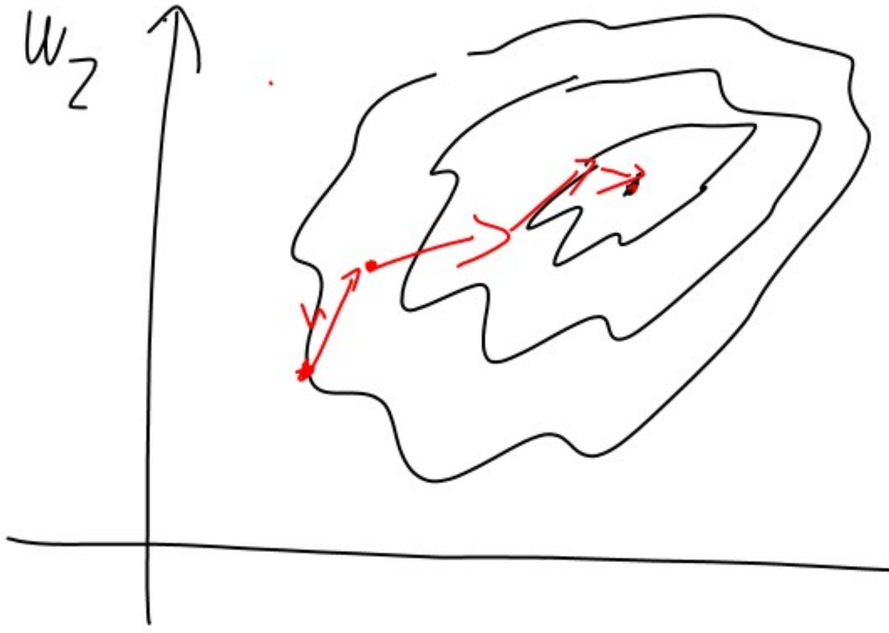
SOFTMAX: $$a_k^L = \frac{e^{z_k^L/T}}{\sum_k e^{z_k^L/T}}$$

PREDICCIONES: $a^L_1, a^L_2 \dots, a^L_{n_L}$

$$\min_{\{W^\ell, b^\ell\}_{\ell=1}^{L}} \mathcal{L}\left(\{a^L_k\}_{k=1}^{n}, \{y_k\}_{k=1}^{n}\right)$$

$$\mathcal{L} = \frac{1}{2}\sum_k \left(a^L_k - y_k\right)^2$$

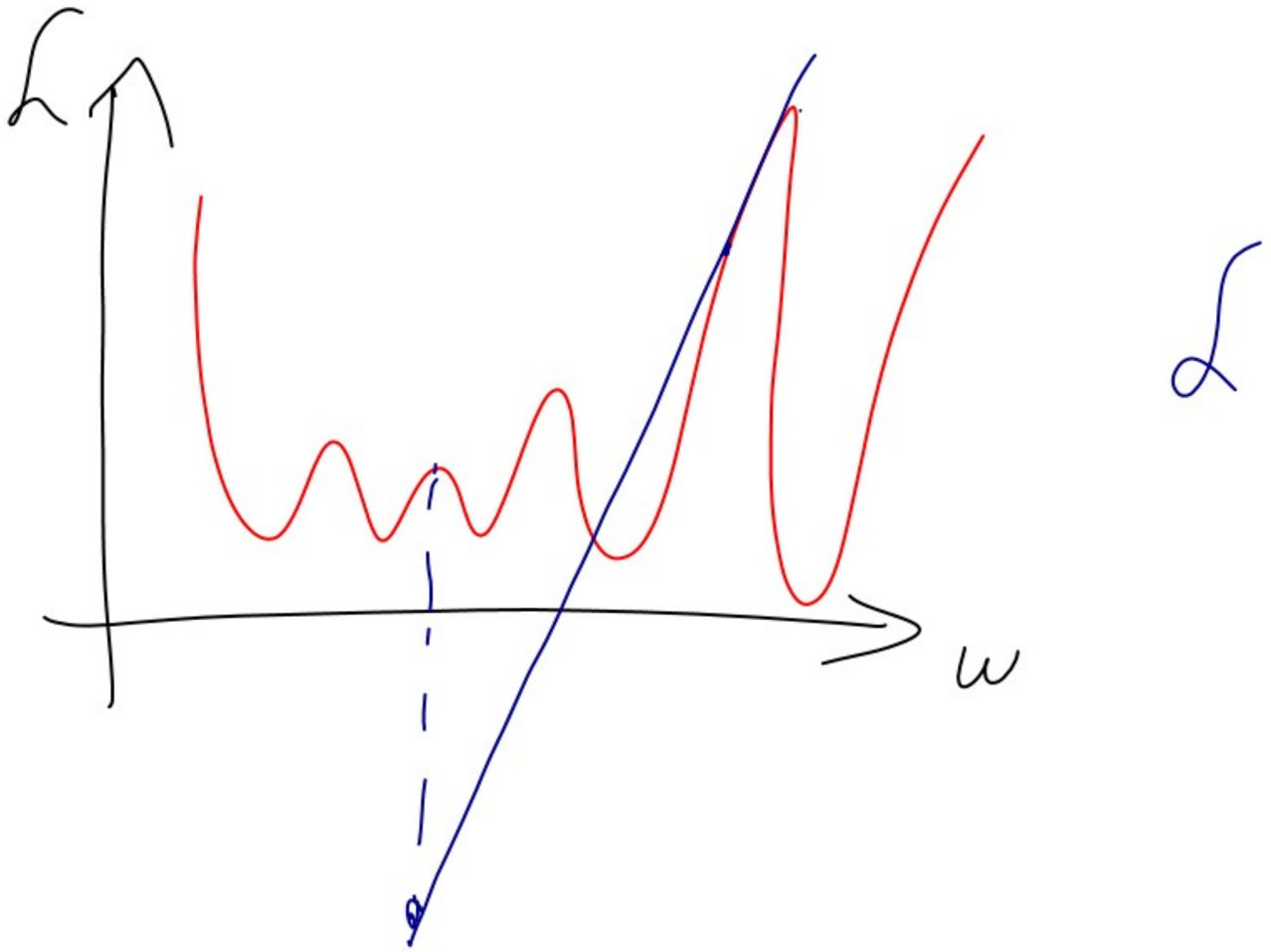
GRADIENTE



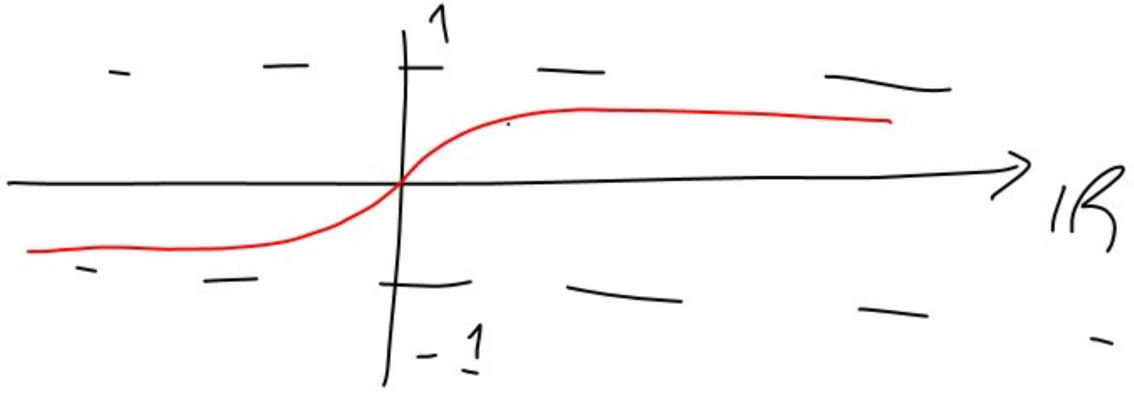
$$-\nabla_{w,b}\mathcal{L}$$

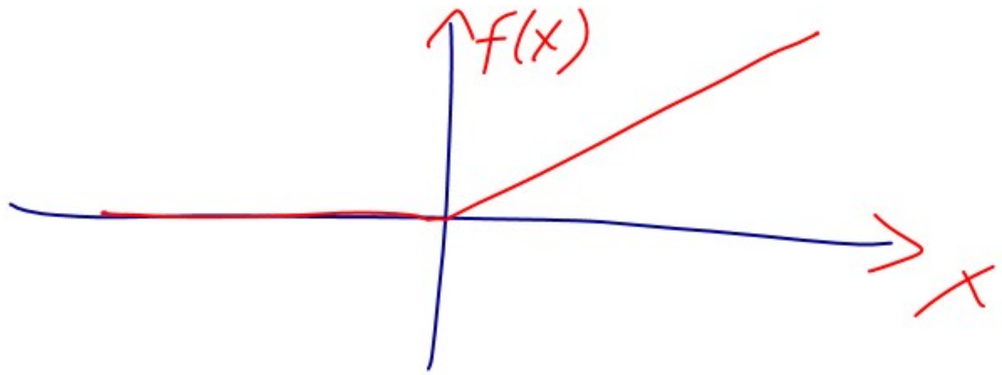
$$\begin{pmatrix} w^m \\ b^m \end{pmatrix} = \begin{pmatrix} w^{m-1} \\ b^{m-1} \end{pmatrix} - \lambda \nabla_{w,b}\mathcal{L}$$

$$\begin{pmatrix} \frac{\partial \mathcal{L}}{\partial w_{11}^1} \\ \frac{\partial \mathcal{L}}{\partial w_{12}^1} \end{pmatrix}$$


L
w
L

$f(\cdot)$ ① TANG HIPERBÓLICA



$$f(x) = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}$$

② RELU $f(x) = MAX(0, x)$