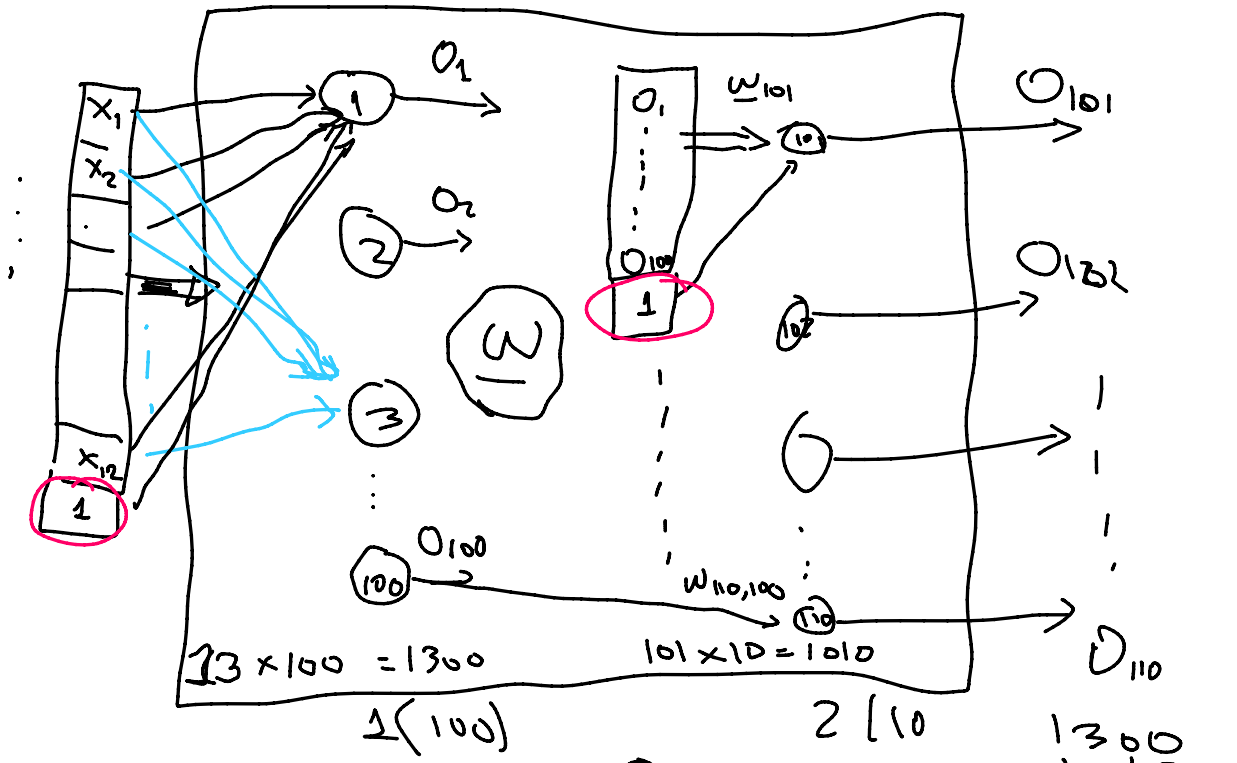
Εργαστηριακή Ασκηση 4

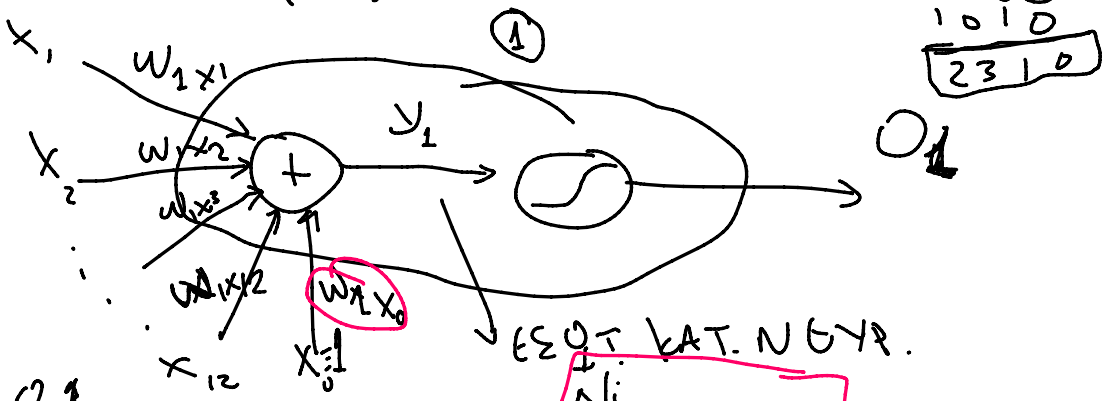
Friday, January 8, 2021 2:00 PM

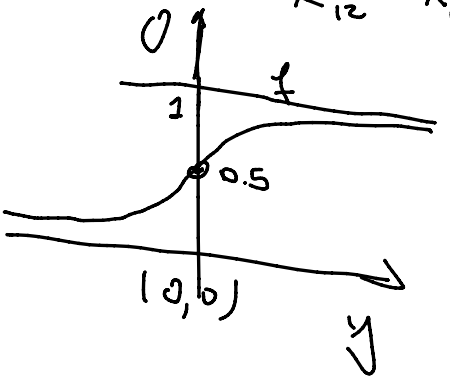
ΚΑΛΗ ΧΡΟΝΙΑ

ΑΡΧΙΖΟΥΜΕ 14:15



1300
1010
2310





$$y_i = \sum_{j=1}^{N_i} w_{ij} O_j$$

$$O_i = f(y_i)$$

PERCE

$$f(y_i) = \frac{1}{1+e^{-y_i}}$$

[Logistic

$f(y_i) = \frac{\;}{1+e^{-y_i}}$

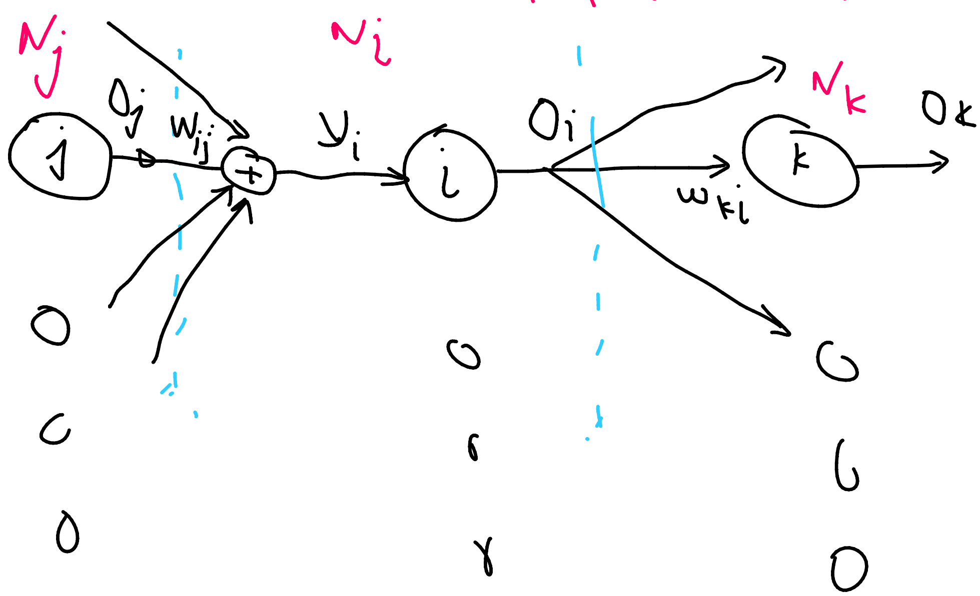
```
for(q=0; q<100; q++) {
    for(i=0; i<12; i++)  → sum=0;
        sum += w[q][i]*x[i];
    O1[q] = 1.0/(1+exp(-(sum+w[13]));
}
```

10 min

```
for
    for
```

20 min.

ERROR BACK-PROPAG.

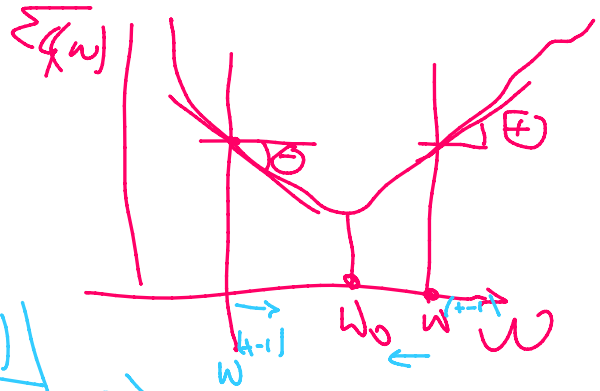


$NS(\underline{w}, \underline{x})$

$\underline{O}_i$ 2

$(\underline{x}_1, \underline{b}_1)$
$(\underline{x}_2, \underline{b}_2)$
$\vdots$
$(\underline{x}_N, \underline{b}_N)$

$$\Sigma_{\varphi(\underline{w})} = \sum_{i=1}^{N} \| \underline{N}_{\delta}(\underline{w}, \underline{x}_i) - \underline{b}_i \|^2$$

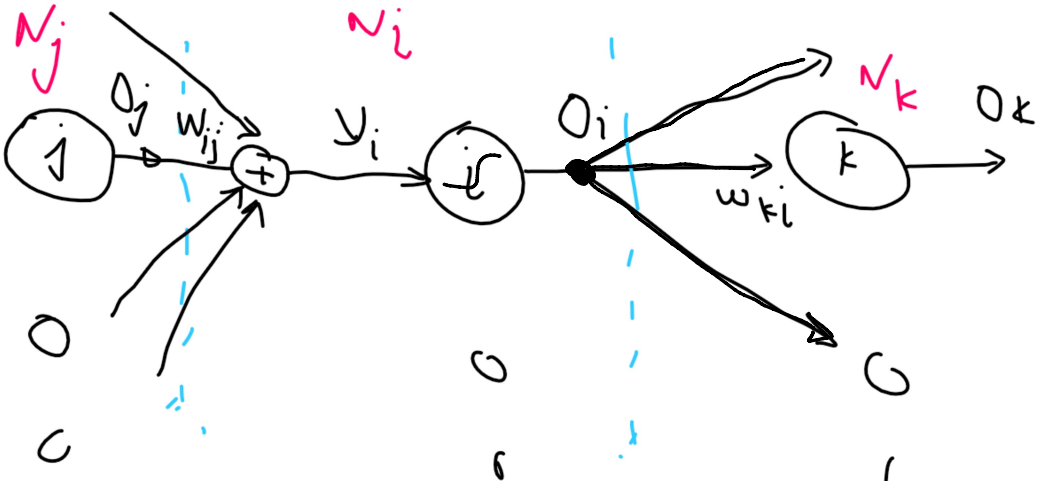


$\alpha > 0$

$$w_{ij}^{(t)} = w_{ij}^{(t-1)} - \alpha \left(\frac{\partial \Sigma_{\varphi(w)}}{\partial w_{ij}} \right) \Rightarrow$$

$$\Delta w_{ij} = w_{ij}^{(t)} - w_{ij}^{(t-1)} = \boxed{- \alpha \frac{\partial \Sigma_{\varphi(w)}}{\partial w_{ij}} = \Delta w_{ij}}$$

ERROR BACK-PROPAG.



$$\Delta w_{ij} = - \alpha \frac{\partial \Sigma_{\varphi(\underline{w})}}{\partial w_{ij}} = - \alpha \frac{\partial \Sigma_{\varphi(\underline{w})}}{\partial y_i} \frac{\partial y_i}{\partial w_{ij}}$$

$$\Delta w_{ij} = -\alpha \frac{\partial E_p(w)}{\partial w_{ij}} = -\alpha \frac{\partial E_p(w)}{\partial y_i} \frac{\partial y_i}{\partial w_{ij}}$$

$$\Delta w_{ij} = \alpha \left(-\frac{\partial E_p(w)}{\partial y_i} \right) \cdot o_j = \alpha \delta_i o_j = \Delta w_{ij}$$

$$\delta_i$$

$$\delta_i = -\frac{\partial E_p(w)}{\partial y_i} = -\frac{\partial E_p(w)}{\partial o_i} \left(\frac{\partial o_i}{\partial y_i} \right) =$$

$$= -\frac{\partial E_p(w)}{\partial o_i} f'(y_i) = f'(y_i) \sum_{k=1}^{N_k} \left(-\frac{\partial E_p(w)}{\partial y_k} \right) \frac{\partial y_k}{\partial o_i}$$

Ep(w)

$$f(y_1, y_2, y_3, \ldots y_N) \qquad \frac{\partial f}{\partial x} = \sum_{i=1}^{N} \frac{\partial f}{\partial y_i} \frac{\partial y_i}{\partial x}$$

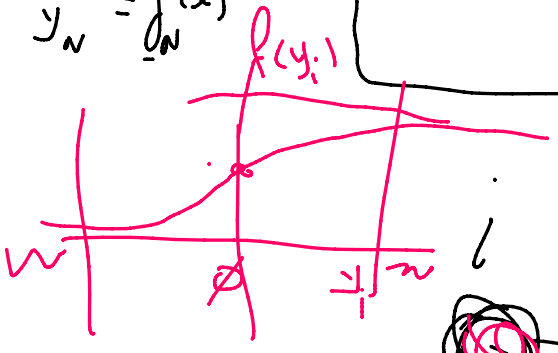
$$y_1 = g_1(x)$$

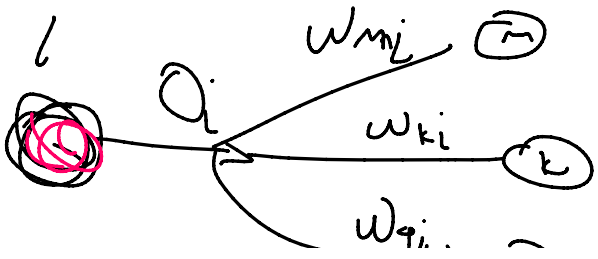
$$y_2 = g_2(x)$$

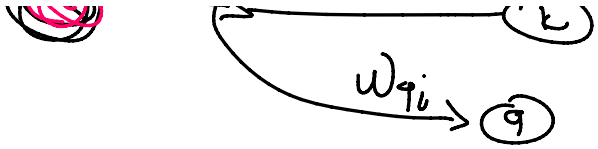
$$\vdots$$

$$y_N = g_N(x)$$

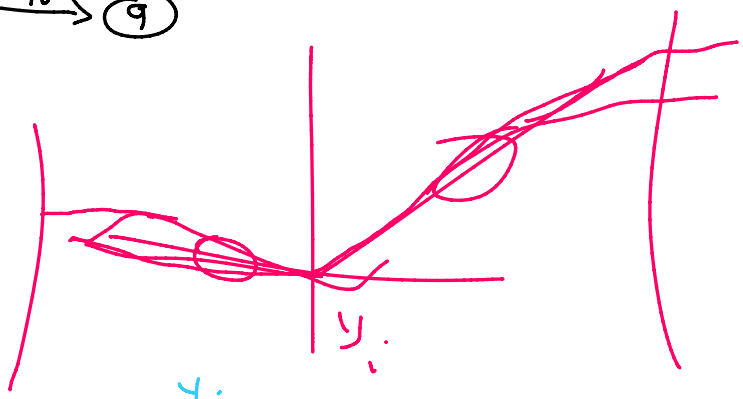
$$\delta_i = f'(y_i) \cdot \sum_{k=1}^{N_k} \delta_k w_{ki}$$



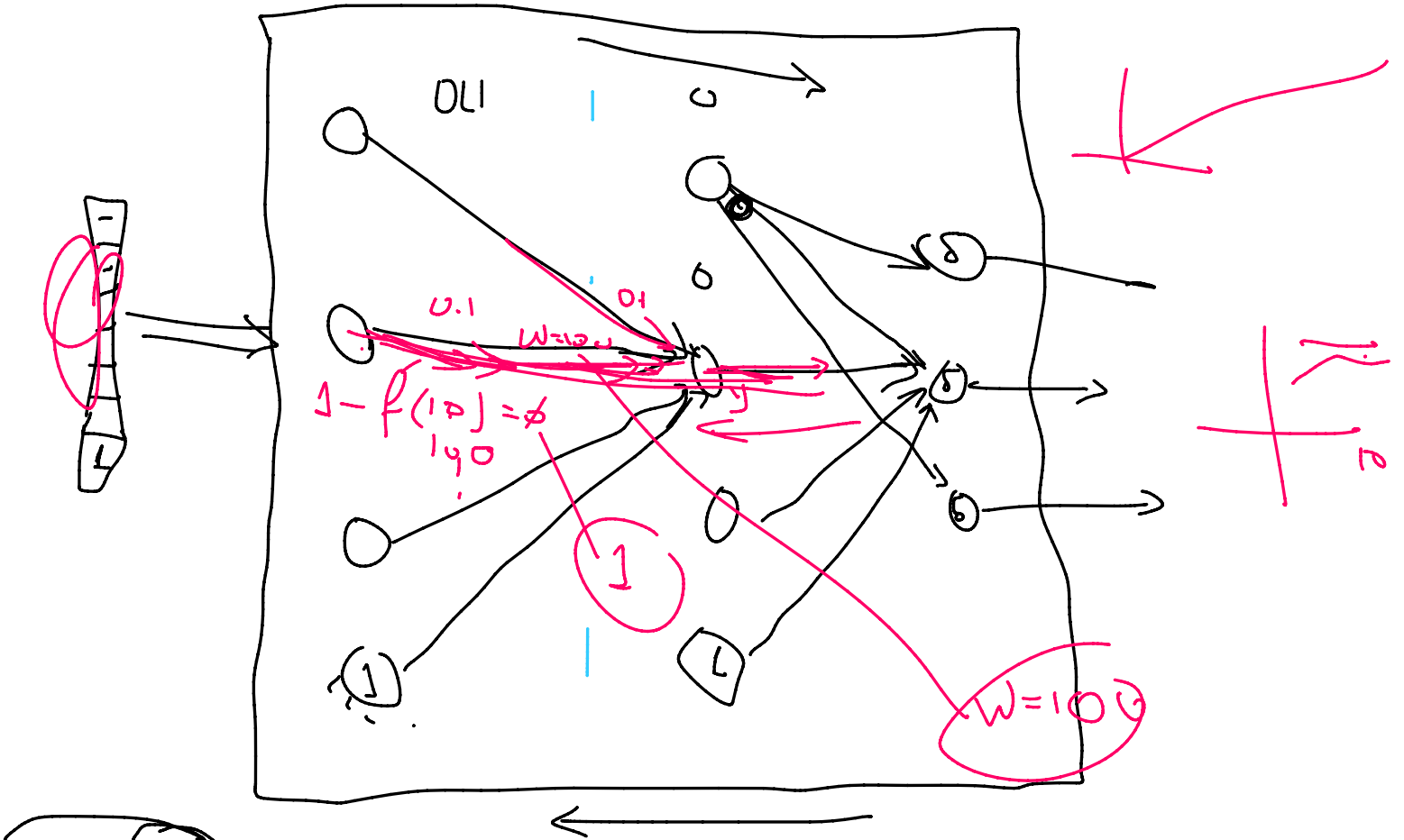




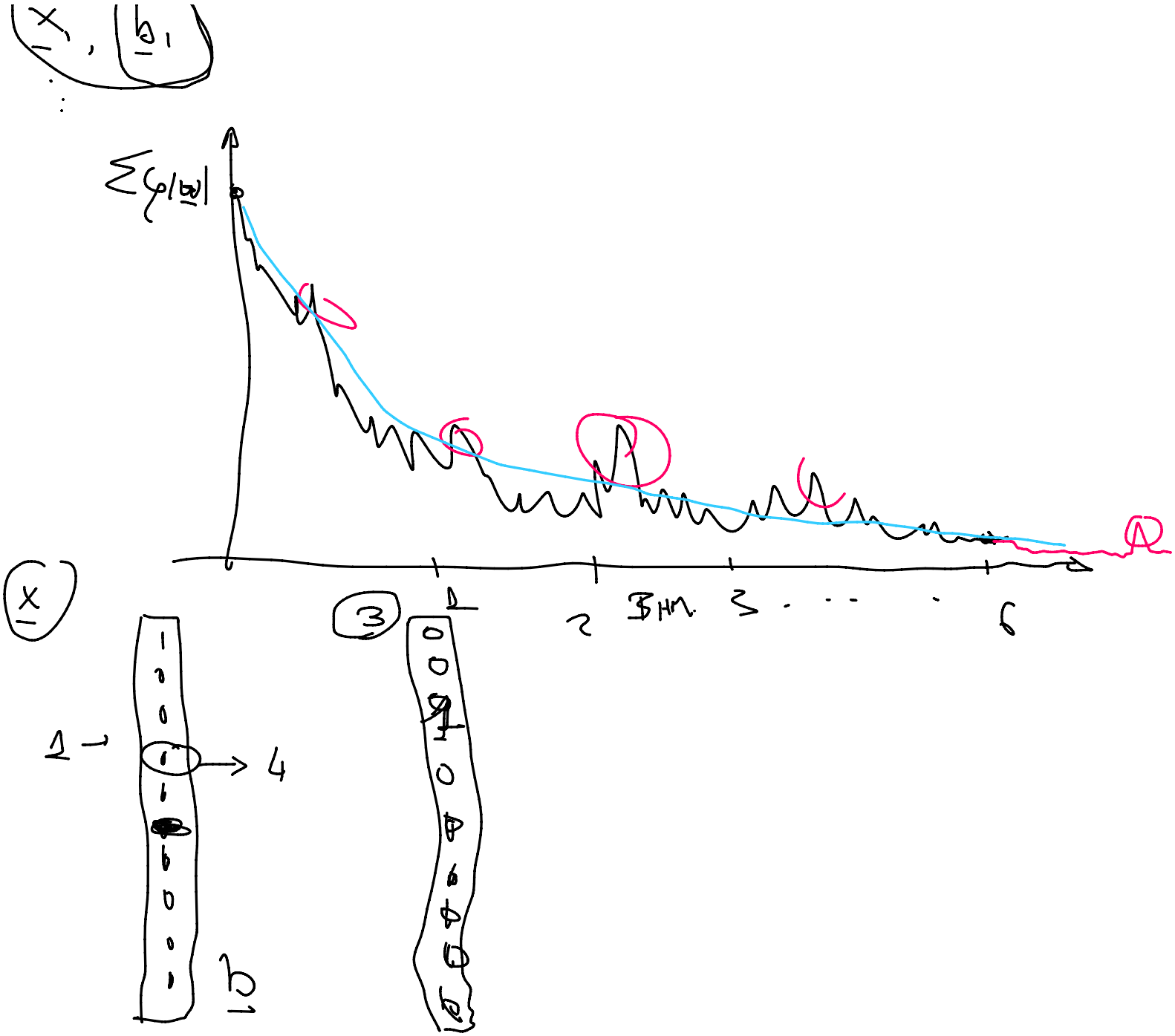
$$\delta_i = -\frac{\partial E_{q|w|}}{\partial y_i}$$



$$f'(x) \frac{\partial f(|y_i|)}{\partial y_i} = \frac{1}{1+e^{-y_i}} \cdot \left(-\frac{y_i e^{-y_i}}{(1+e^{-y_i})^2}\right)$$



x_1, b_1

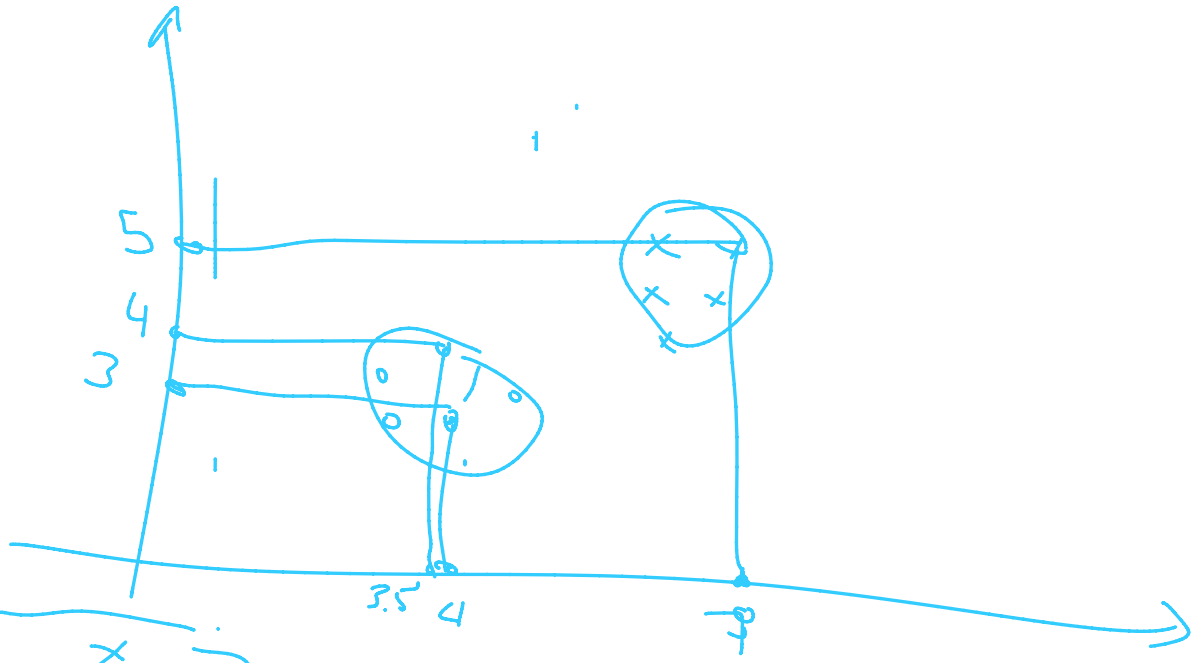


(y) →

(x) →

0

1, 2



z

(3.5, 4) 1 $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

(4, 3) 1 $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

(7, 5) 2 $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$