$W^{[1]}$

$$z^{[1]} = \begin{bmatrix} \text{---}\ w_1^{[1]T}\ \text{---} \\ \text{---}\ w_2^{[1]T}\ \text{---} \\ \text{---}\ w_3^{[1]T}\ \text{---} \\ \text{---}\ w_4^{[1]T}\ \text{---} \end{bmatrix}_{(4,3)} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \underbrace{\begin{bmatrix} b_1^{[1]} \\ b_2^{[1]} \\ b_3^{[1]} \\ b_4^{[1]} \end{bmatrix}}_{b^{[1]}\ (4,1)} = \begin{bmatrix} w_1^{[1]T} x + b_1^{[1]} \\ w_2^{[1]T} x + b_2^{[1]} \\ w_3^{[1]T} x + b_3^{[1]} \\ w_4^{[1]T} x + b_4^{[1]} \end{bmatrix} = \begin{bmatrix} z_1^{[1]} \\ z_2^{[1]} \\ z_3^{[1]} \\ z_4^{[1]} \end{bmatrix}$$

Need to define a:

$$a^{[1]} = \begin{bmatrix} a_1^{[1]} \\ \vdots \\ a_4^{[1]} \end{bmatrix} = \sigma(z^{[1]})$$

For the first layer, given input x:

$$z^{[1]}_{(4,1)} = W^{[1]}_{(4,3)} \overset{a^{[0]}}{x} + b^{[1]}_{(4,1)}$$
$$a^{[1]}_{(4,1)} = \sigma(z^{[1]})$$
$$z^{[2]}_{(1,1)} = W^{[2]}_{(1,4)} a^{[1]}_{(4,1)} + b^{[2]}_{(1,1)}$$
$$a^{[2]}_{(1,1)} = \sigma(z^{[2]})$$

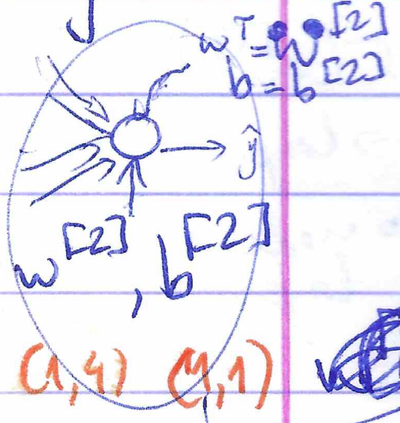
hidden

output

Need these 4 lines of code to compute the output

$x = a^{[0]}$

$\hat{y} = a^{[2]}$



This last unit is like log. reg.

$$z = w^T x + b$$
$$\hat{y} = a = \sigma(z)$$

Vectorising Across Multiple Examples

Computing for MULTIPLE EXAMPLES (m)

$x \rightarrow a^{[2]} = \hat{y}$ example

$x^{(1)} \rightarrow a^{[2](1)} = \hat{y}^{(1)}$ layer

$x^{(2)} \rightarrow a^{[2](2)} = \hat{y}^{(2)}$

$\vdots$

$x^{(m)} \rightarrow a^{[2](m)} = \hat{y}^{(m)}$

for $i = 1 : m$:

$$z^{[1](i)} = W^{[1]} x^{(i)} + b^{[1]}$$
$$a^{[1](i)} = \sigma(z^{[1](i)})$$
$$z^{[2](i)} = W^{[2]} a^{[1](i)} + b^{[2]}$$
$$a^{[2](i)} = \sigma(z^{[2](i)})$$