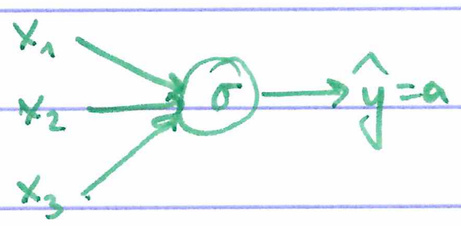
$$dZ^{[1]} = W^{[2]T} dZ^{[2]} * g^{[1]'}(Z^{[1]})$$ — $(n^{[1]}, m)$ — $(n^{[1]}, m)$ — * element-wise product

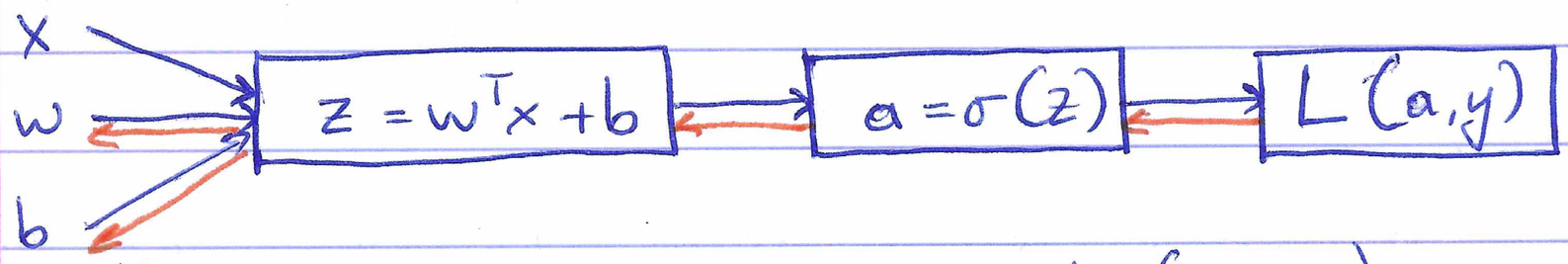
$$dW^{[1]} = \frac{1}{m} dZ^{[1]} X^T$$

$$db^{[1]} = \frac{1}{m} \text{np.sum}(dZ^{[1]}, \text{axis}=1, \text{keepdims}=\text{True})$$ — $(n^{[1]}, 1)$ — $(n^{[1]}, m)$ — reshape

Backprop. intuition

Log. reg.:





$dw = dz \cdot x$
$db = dz$
$dz = a - y$

$$da = \frac{d}{da}\left(L(a,y)\right) = -y\log(a) - (1-y)\log(1-a)$$
$$= -\frac{y}{a} + \frac{1-y}{1-a}$$

$$dz = da \cdot g'(z)$$

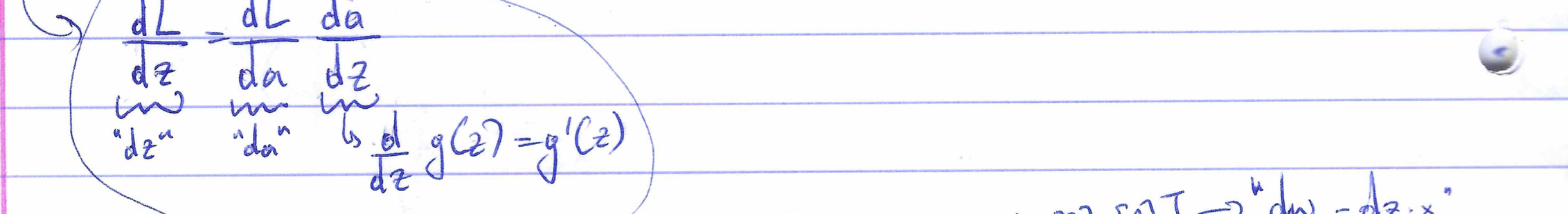
$$\frac{dL}{dz} = \frac{dL}{da}\frac{da}{dz}$$
"dz" "da" $\frac{d}{dz} g(z) = g'(z)$

$g(z) = \sigma(z)$

Now: $x_1, x_2, x_3 \to \circ \to \circ \to \hat{y}$ (2 layer NN)

We don't take derivatives for x, as it's fixed for SL

$dW^{[1]} = dz^{[1]} x^T$
$db^{[1]} = dz^{[1]}$
$a^{[0]T}$



$= dz^{[2]} a^{[1]T}$ → "$dw = dz \cdot x$"

$w^{[2]} = [\cdots]$

$W^{[2]}$ is $(n^{[2]}, n^{[1]})$

$z^{[2]}, dz^{[2]}$ is $(n^{[2]}, 1)$ or $(1, 1)$

$z^{[1]}, dz^{[1]}$ is $(n^{[1]}, 1)$

$$dz^{[1]} = W^{[2]T} dz^{[1]} * g^{[1]'}(z^{[1]})$$
$(n^{[1]}, 1)$ $(n^{[1]}, n^{[0]})$ $(n^{[0]}, 1)$ $(n^{[1]}, 1)$

foo $W^{[1]}$ → dfoo $dW^{[1]}$