

Hws 2 18.11.2019

Q1.1  $x=4, y=-3, z=-1$

$$q = x + y$$

$$f = q \cdot z$$

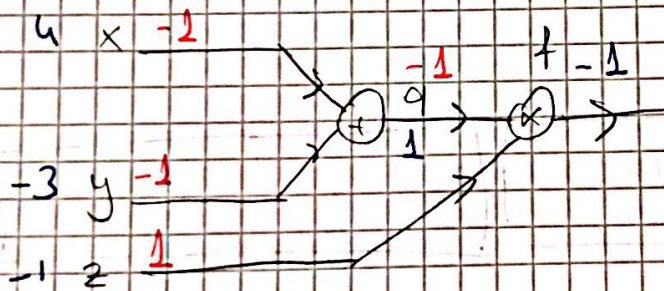
$$dq/dx = 1, dq/dy = 1$$

$$df/dq = z, df/dz = q$$

$$\frac{df}{dq} = z = -1, \frac{df}{dz} = q = x + y = 1$$

$$\frac{df}{dx} = \frac{df}{dq} \cdot \frac{dq}{dx} = -1 \cdot 1 = -1$$

$$\frac{df}{dy} = \frac{df}{dq} \cdot \frac{dq}{dy} = -1 \cdot 1 = -1$$

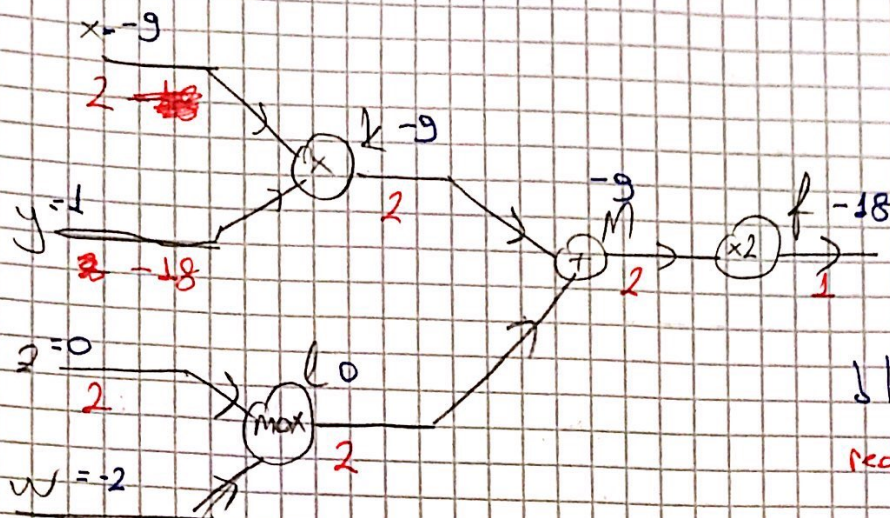


blue forward pass  
red backward pass



Q1.2

$x = -9, y = 1, z = 0, w = -2$  (initial values)



blue: forward pass  
red: backward pass

$\frac{df}{dw}, \frac{df}{dz}, \frac{df}{dy}, \frac{df}{dx}$  needed.

$$f = 2m, m = k + l, k = x \cdot y, l = \max(z, w)$$

$$\left| \frac{df}{dm} = 2 \right|, \left| \frac{df}{dk} = \frac{df}{dm} \cdot \frac{dm}{dk} = 2 \right|, \left| \frac{df}{dl} = \frac{df}{dm} \cdot \frac{dm}{dl} = 2 \right|$$

$$\rightarrow \frac{df}{dx} = \frac{df}{dm} \cdot \frac{dm}{dk} \cdot \frac{dk}{dx} = 2 \cdot y = 2$$

$$\rightarrow \frac{df}{dy} = \frac{df}{dm} \cdot \frac{dm}{dk} \cdot \frac{dk}{dy} = 2 \cdot x = -18$$

$$\rightarrow \frac{dl}{dz} = \text{for } z > w = 1, \quad \frac{dl}{dw} = \text{for } w > z = 1$$

$$\text{for } z < w = 0, \quad \text{for } w < z = 0$$

$$\rightarrow \frac{df}{dz} = \frac{df}{dm} \cdot \frac{dm}{dl} \cdot \frac{dl}{dz} = 2 \cdot 1 \cdot 1 = 2$$

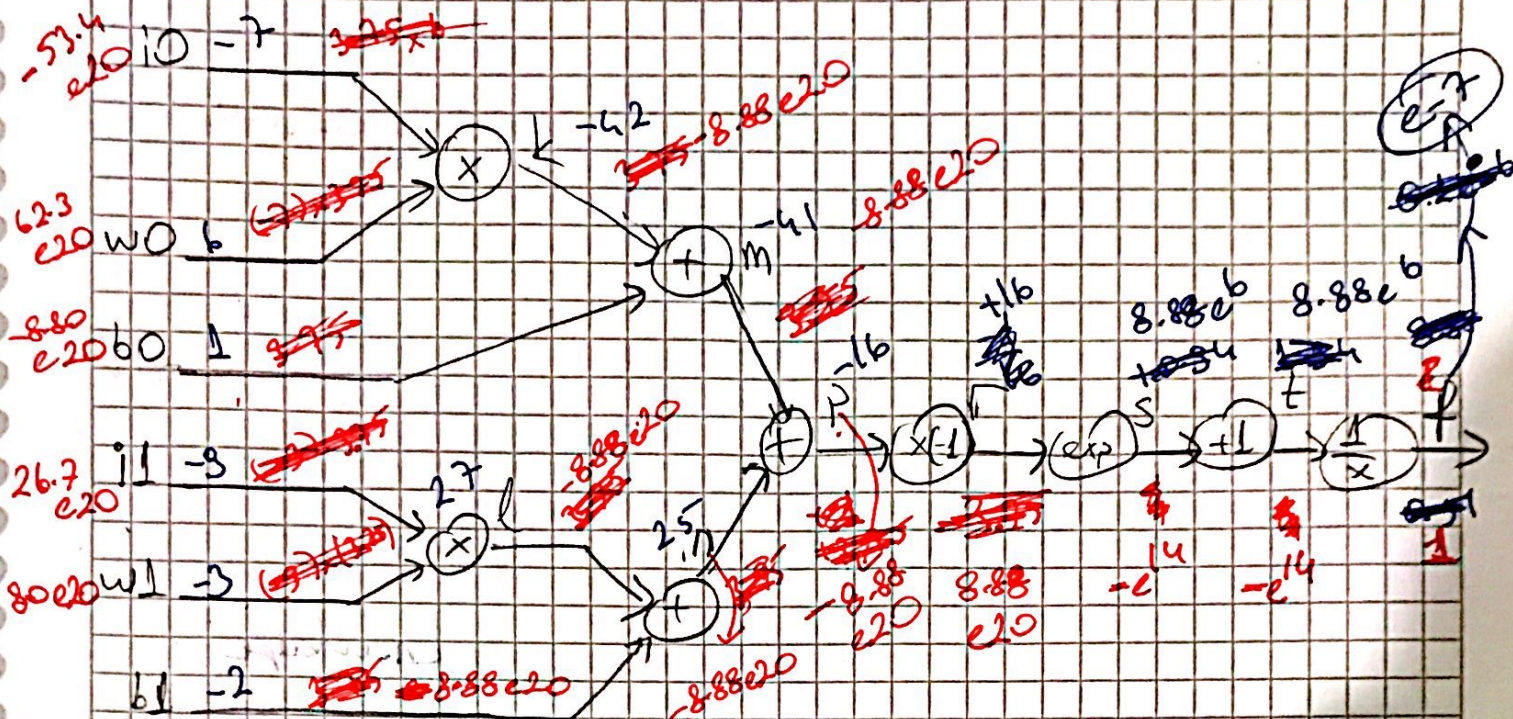
$$\rightarrow \frac{df}{dw} = \frac{df}{dm} \cdot \frac{dm}{dl} \cdot \frac{dl}{dw} = 2 \cdot 1 \cdot 0 = 0$$

since  $z > w$



Q1.3

$$j_0 = -7, \omega_0 = 6, b_0 = 1, i_1 = -9, \omega_1 = -3, b_1 = -2$$



$$\left[ \frac{df}{dt} = \frac{-1}{t^2} \right] \left[ \frac{df}{ds} = \frac{df}{dt} \cdot \frac{dt}{ds} = \frac{-1}{t^2} \right] \left[ \frac{df}{dr} = \frac{df}{ds} \cdot \frac{ds}{dr} = \frac{-e^r}{t^2} \right]$$

$$\rightarrow \frac{df}{dp} = \frac{df}{dr} \cdot \frac{dr}{dp} = -\frac{e^r}{z^2} \cdot (-1) = \frac{e^r}{z^2}$$

$$\left[ \frac{dI}{dm} = \frac{dI}{dP} \cdot \frac{dP}{dm} = \frac{e^r}{t^2} \right], \left[ \frac{dI}{dn} = \frac{e^r}{t^2} \right]$$

$$\left( \frac{df}{dk} = \frac{df}{dm} \cdot \frac{dm}{dk} = \frac{e^r}{t^2} \right) \quad , \quad \left( \frac{df}{db_0} = \frac{df}{dk} \cdot \frac{dk}{db_0} = \frac{e^r}{t^2} \right)$$

$$\left[ \frac{df}{d\omega} = \frac{df}{dk} \cdot \frac{dk}{d\omega} = \frac{\omega_0 \cdot e^{\gamma}}{t^2} \right] \quad \left[ \frac{df}{d\omega_0} = \frac{\omega e^{\gamma}}{t^2} \right]$$

$$\frac{df}{dd} = \frac{df}{dn} \cdot \frac{dn}{de} = \frac{e^r}{t^2} \quad \bigg/ \quad \frac{df}{db} = \frac{df}{dA} \cdot \frac{dA}{db} = \frac{e^r}{t^2}$$

$$\left| \frac{dl}{dl_1} = \frac{dl}{dl} \cdot \frac{dl}{dl_1} = \frac{w_1 \cdot e^r}{t^2} \right| \left| \frac{dl}{dl_1} = \frac{dl}{dl} \cdot \frac{dl}{dl_1} = \frac{w_1 \cdot e^r}{t^2} \right|$$