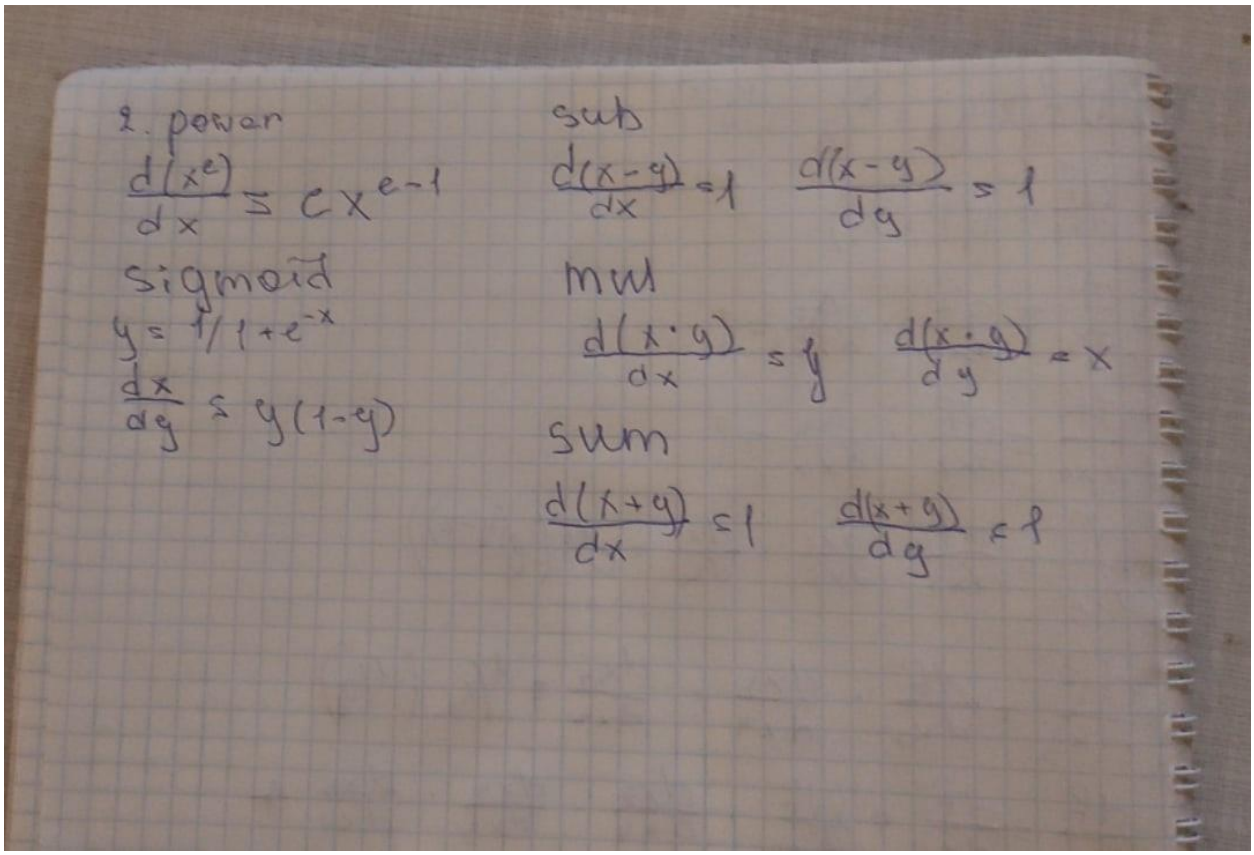

2. power

$$\frac{d(x^e)}{dx} = e x^{e-1}$$

sigmoid

$$y = 1/1+e^{-x}$$

$$\frac{dx}{dg} = y(1-y)$$

sub

$$\frac{d(x-y)}{dx} = 1 \qquad \frac{d(x-y)}{dy} = 1$$

mul

$$\frac{d(x \cdot y)}{dx} = y \qquad \frac{d(x \cdot y)}{dy} = x$$

sum

$$\frac{d(x+y)}{dx} = 1 \qquad \frac{d(x+y)}{dy} = 1$$

① $f(x,y) = x^2/y + e^{(y-x)}$

$\frac{df}{dx_1} = 1 \quad (f = x_7)$

$\frac{df}{dx_6} = \frac{df}{dx_7} \cdot \frac{dx_7}{dx_6} = 1$

$\frac{df}{dx_4} = \frac{df}{dx_7} \cdot \frac{dx_7}{dx_4} = 1$

$\frac{df}{dx_5} = \frac{df}{dx_7} \cdot \frac{dx_7}{dx_6} \cdot \frac{dx_6}{dx_5} = e^{x_5}\left(e^{(y-x)}\right)$

$\frac{df}{dx_3} = \frac{df}{dx_7} \cdot \frac{dx_7}{dx_4} \cdot \frac{dx_4}{dx_3} = 1/x_2 \cdot (1/y)$

$\frac{df}{dx} = \frac{df}{dx_1} = \frac{df}{dx_7} \cdot \frac{dx_7}{dx_4} \cdot \frac{dx_4}{dx_3} \cdot \frac{dx_3}{dx_1} +$

$+ \frac{df}{dx_7} \cdot \frac{dx_7}{dx_6} \cdot \frac{dx_6}{dx_5} \cdot \frac{dx_5}{dx_1} =$

$= 1 \cdot 1 \cdot 1/x_2 \cdot 2x_1 + 1 \cdot 1 \cdot e^{x_5} \cdot (-1) =$

$= \frac{2x_1}{x_2} - e^{x_5} = \frac{2x}{y} - e^{(y-x)}$

$\frac{df}{dy} = \frac{df}{dx_2} = \frac{df}{dx_5} \cdot \frac{dx_5}{dx_2} + \frac{df}{dx_4} \cdot \frac{dx_4}{dx_2} = e^{x_5} \cdot 1 +$

$1 \cdot \left(-\frac{x_3}{x_2^2}\right) = e^{x_5} - \frac{x_3}{x_2^2} = e^{(y-x)} - x^2/y^2$