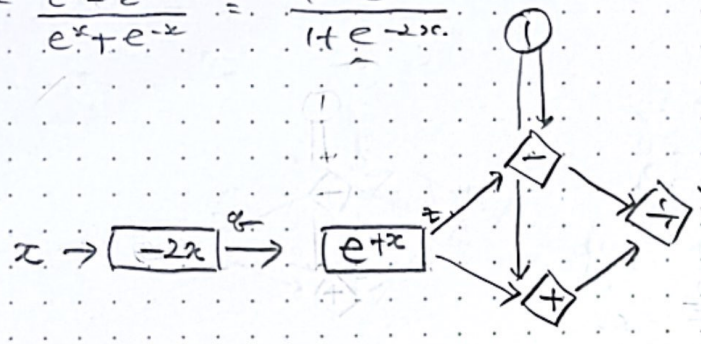
DATE/NO. | TITLE

① tanh 함수

$$y = \frac{e^x - e^{-x}}{e^x + e^{-x}} = \frac{1 - e^{-2x}}{1 + e^{-2x}}$$




$q = -2x$

$z = e + q$

$y = (1 - z) / (1 + z)$

$$\frac{dy}{dz} = \frac{-1 \cdot (1+z) - (1-z) \cdot 1}{(1+z)^2}$$

$$\frac{dz}{dq} = e^q$$

$$\frac{dq}{dx} = -2$$

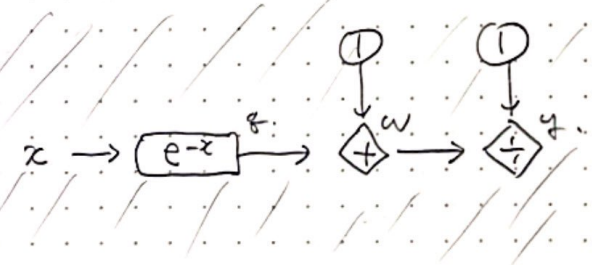
$$\frac{dy}{dx} = \frac{dy}{dz} \cdot \frac{dz}{dq} \cdot \frac{dq}{dx}$$

$$= \frac{-1-z-1+z}{(1+z)^2} \times e^q \times (-2)$$

$$= \frac{(-2) \cdot e^q \cdot (-2)}{(1+z)^2} = \frac{4e^{-2x}}{(1+e^{-2x})^2}$$

② logistic 함수

$$y = \frac{e^x}{1+e^x} = \frac{1}{1+e^{-x}}$$




$q = e^{-x}$ $\quad dy/dw = -1/w^2$

$w = 1 + q$ $\quad dw/dq = 1$

$y = 1/w$ $\quad dq/dx = e^{-x} \cdot (-1)$

$$dy/dx = \frac{dy}{dw} \cdot \frac{dw}{dq} \cdot \frac{dq}{dx}$$

$$= \frac{-1}{w^2} \cdot 1 \cdot e^{-x} \cdot (-1)$$

$$= \frac{e^{-x}}{w^2} = \frac{e^{-x}}{(1+q)^2} = \frac{e^{-x}}{(1+e^{-x})^2}$$

$$= \frac{1}{1+e^{-x}} \cdot \frac{e^{-x}}{1+e^{-x}}$$

$$= y \cdot (1-y)$$