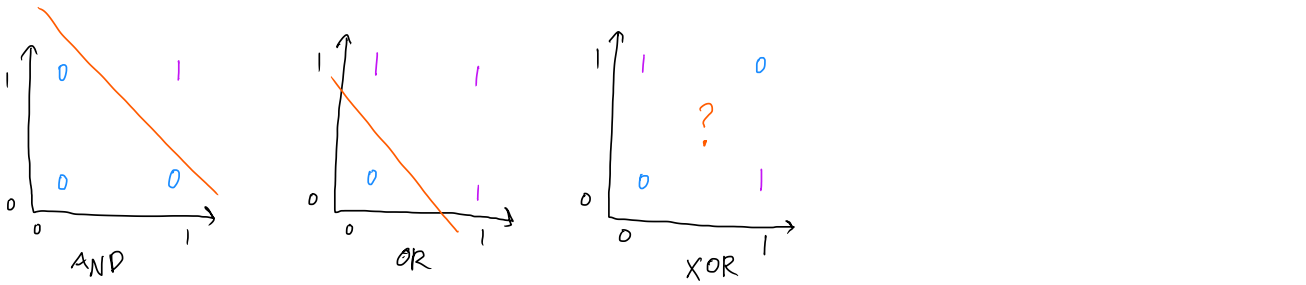
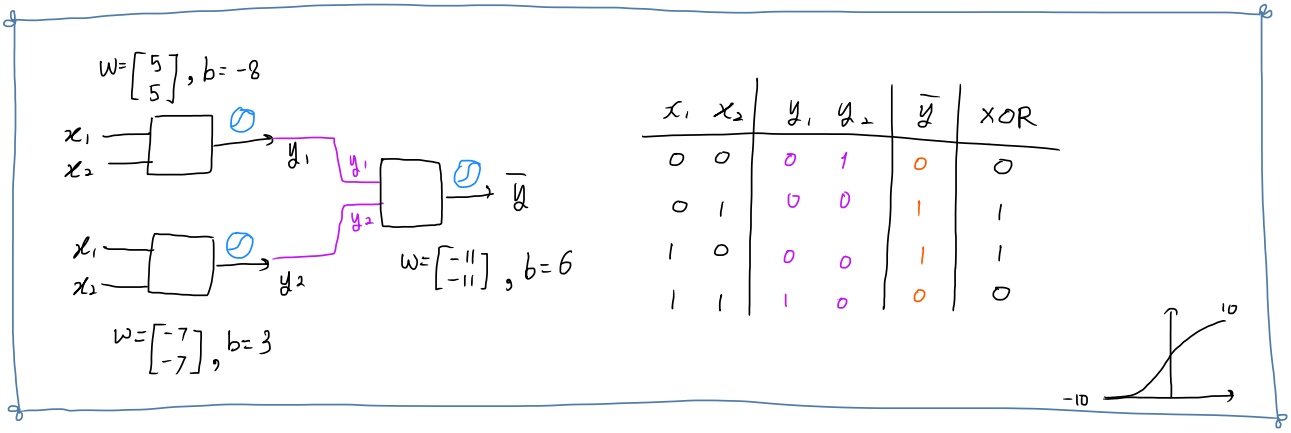
Neural Network로 XOR 풀기





x_1	x_2	y_1	y_2	$\bar{y}$	XOR
0	0	0	1	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	0	0	0

$[0\ 0]\begin{bmatrix}5\\5\end{bmatrix}-8=-8 \rightarrow y_1=S(-8)=0$

$[0\ 0]\begin{bmatrix}-7\\-7\end{bmatrix}+3=3 \rightarrow y_2=S(3)=1$

$\rightarrow [0\ 1]\begin{bmatrix}-11\\-11\end{bmatrix}+b=-5 \rightarrow \bar{y}=S(-5)=0$

$-11+6$

$x_1=0,\ x_2=0$

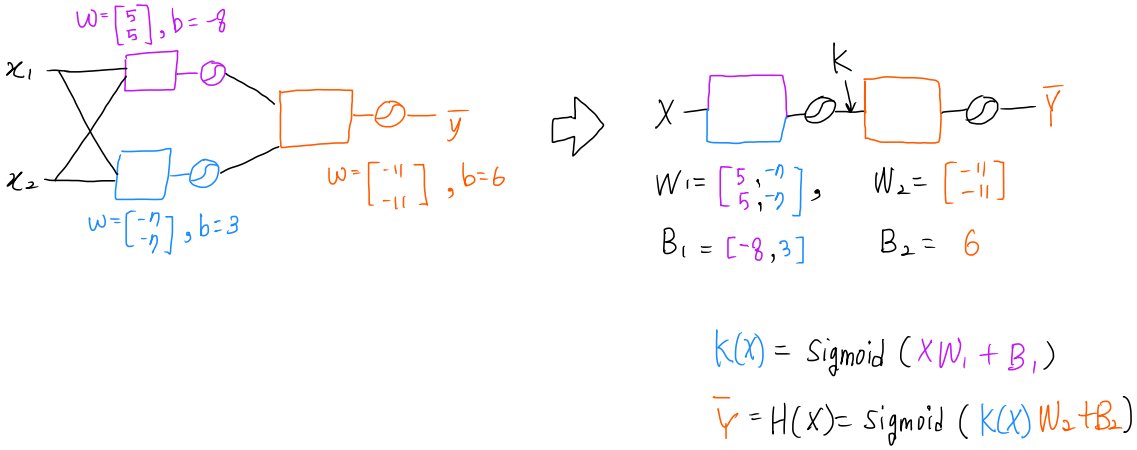
$[0\ 1]\begin{bmatrix}5\\5\end{bmatrix}-8=-3 \rightarrow y_1=S(-3)=0$

$[0\ 1]\begin{bmatrix}-7\\-7\end{bmatrix}+3=-4 \rightarrow y_2=S(-4)=0$

$\rightarrow [0\ 0]\begin{bmatrix}-11\\-11\end{bmatrix}+6=6 \rightarrow \bar{y}=S(6)=1$

$x_1=0,\ x_2=1$

Forward Propagation → Neural Network



미분기초

- 미분을 알아야 하니 잠깐 기초를 정리하고 갑시다

$$\frac{d}{dx}f(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

순간 변화량을 구하는데 사용됨

기울기

$\Delta x = 0.01$, $f(x) = 2x$ → $\frac{f(x+0.01) + f(x)}{0.01} = \frac{x + 0.01 - x}{0.01} = 1$

편미분

$f(x,y) = xy$, $\frac{\partial f}{\partial x}$ ← x를 미분하라는 것! → y

↳ y는 상수취급 됨!

$f(x,y) = xy$, $\frac{\partial f}{\partial y}$ → x

↳ x 상수취급

$f(x,y) = x + y$, $\frac{\partial f}{\partial x}$ → 1

↳ 1 ↳ 상수=0

Chain Rule

$f(g(x))$ ← 복합함수를 미분하는 법

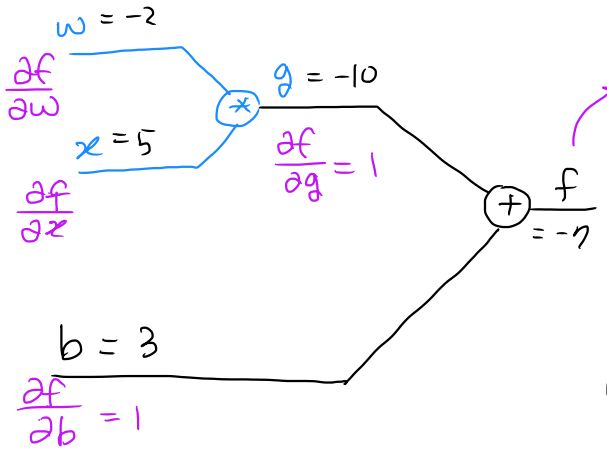
$$\frac{\partial f}{\partial x} = \frac{\partial f}{\partial g} \cdot \frac{\partial g}{\partial x}$$

각각의 미분 값을 곱하면 됨!

Back propagation

$f = wx + b$, $g = wx$, $f = g + b$ → $\frac{\partial f}{\partial b} = 1$, $\frac{\partial f}{\partial g} = 1$

↘ $\frac{\partial g}{\partial x} = w$, $\frac{\partial g}{\partial w} = x$



w, x, b가 f에 각각 어느정도 영향을 주는지 구하려면 미분을 하면 된다!

① forward (w=-2, x=5, b=3)

② backward

$\frac{\partial f}{\partial w} = \frac{\partial f}{\partial g} * \frac{\partial g}{\partial w} = 1 * x = 5$ → w는 f에 5배의 영향을 줌

$\frac{\partial f}{\partial x} = \frac{\partial f}{\partial g} * \frac{\partial g}{\partial x} = 1 * w = -2$ → x는 f에 -2배의 영향을 줌