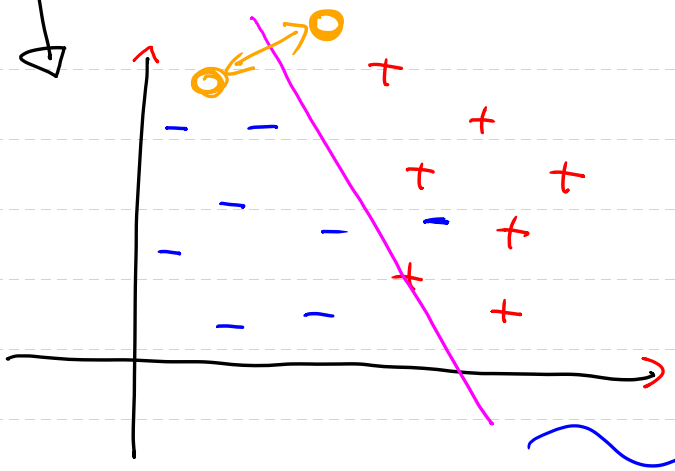
- 03/05 Logistic Regression → Binary Classification (이진분류) [0, False / 1, True]

Multinomial Classification (다중분류) : 여러개의 분류중에 어떤 분류에 속하는지를 예측.



x_1	x_2	x_3	T
20	10	3	1
7	6	3	0
5	5	8	1
⋮			

→ 3차원 공간에 점이 찍혀요 !!

(평면을 구해야 해요 !!

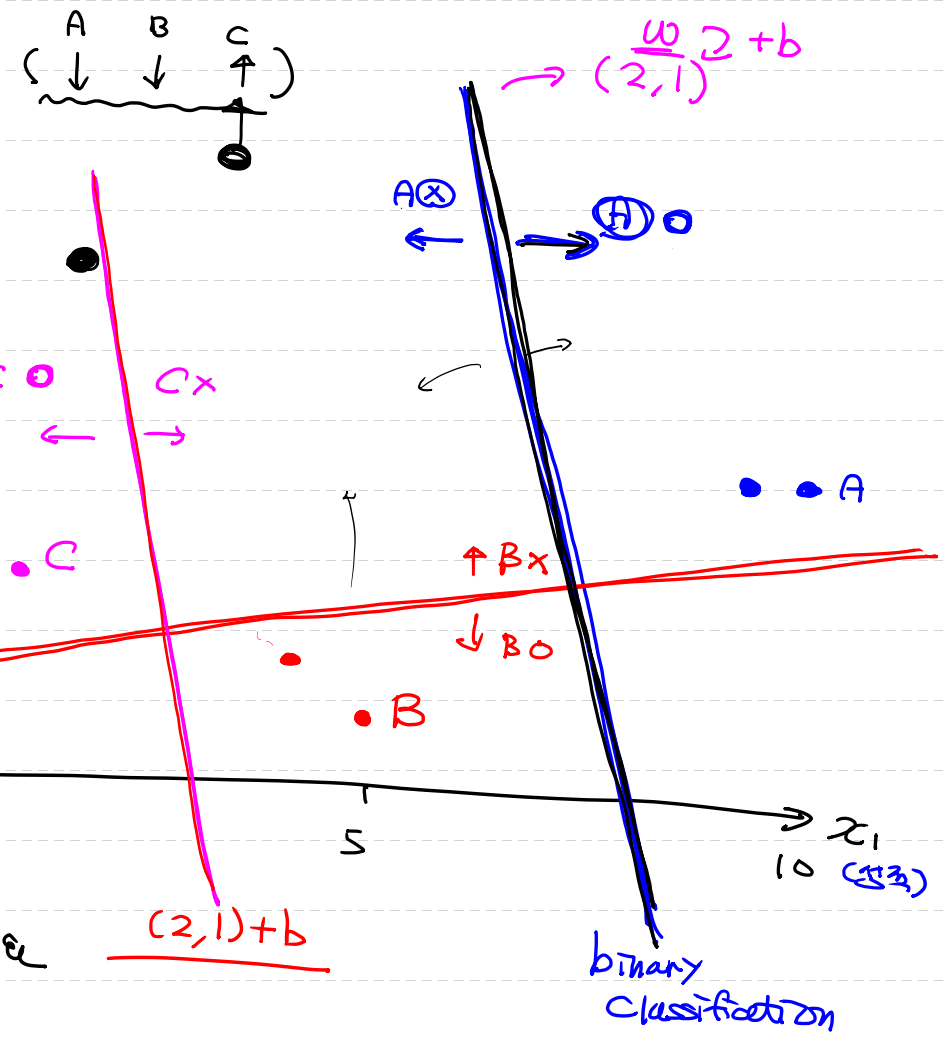
초평면 (hyperplane)

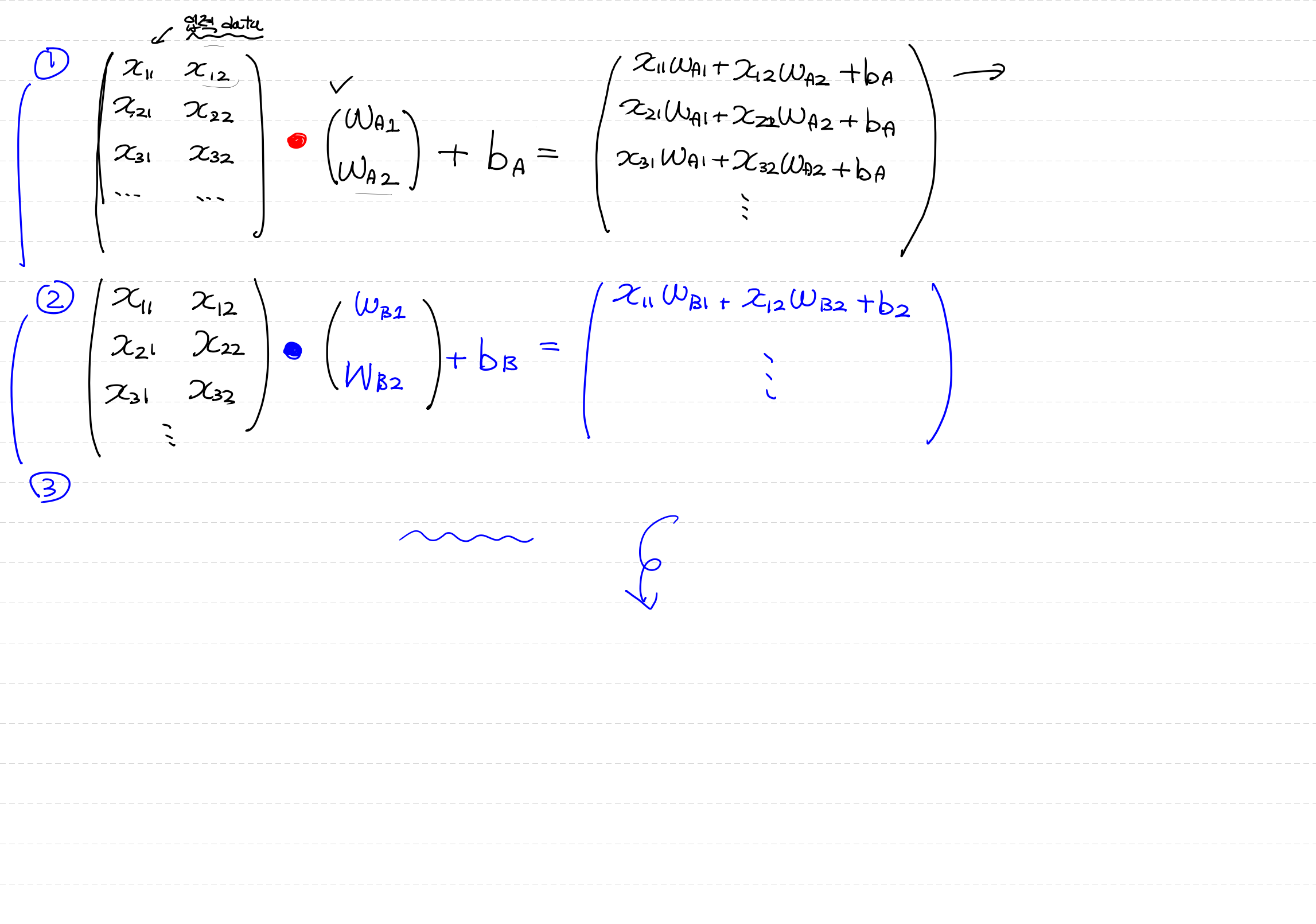
Training Data Set

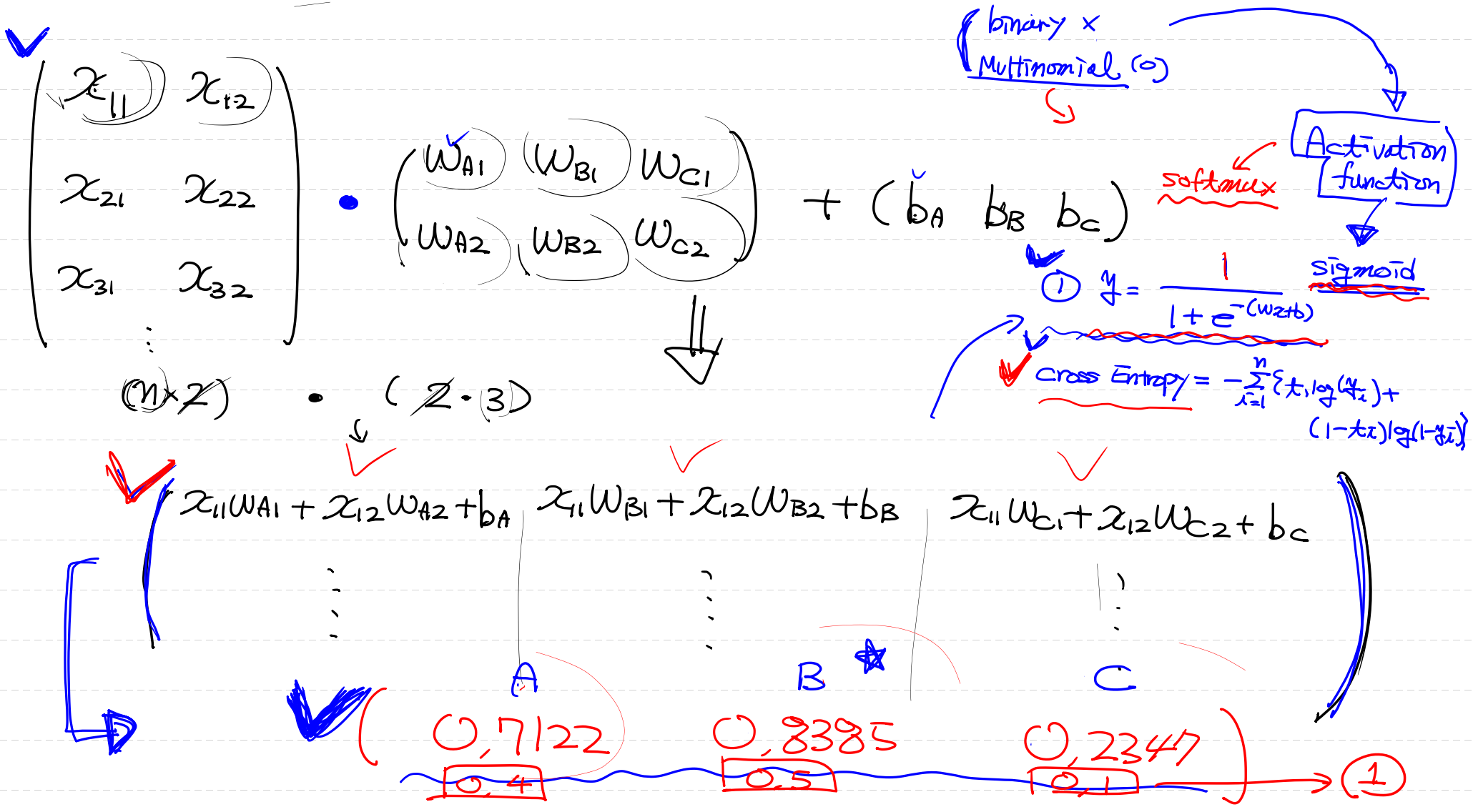
x_1 (성적)	x_2 (출석)	t (grade)
10	5	A
9	5	A
5	1	B
4	2	B
1	3	C

label을 보아하므로 multinomial

3개면 3개의 logistic regression이필요




data
①
$\begin{pmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \\ x_{31} & x_{32} \\ \cdots & \cdots \end{pmatrix} \cdot \begin{pmatrix} w_{A1} \\ w_{A2} \end{pmatrix} + b_A = \begin{pmatrix} x_{11}w_{A1} + x_{12}w_{A2} + b_A \\ x_{21}w_{A1} + x_{22}w_{A2} + b_A \\ x_{31}w_{A1} + x_{32}w_{A2} + b_A \\ \vdots \end{pmatrix} \rightarrow$
②
$\begin{pmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \\ x_{31} & x_{32} \\ \vdots \end{pmatrix} \cdot \begin{pmatrix} w_{B1} \\ w_{B2} \end{pmatrix} + b_B = \begin{pmatrix} x_{11}w_{B1} + x_{12}w_{B2} + b_2 \\ \vdots \end{pmatrix}$
③

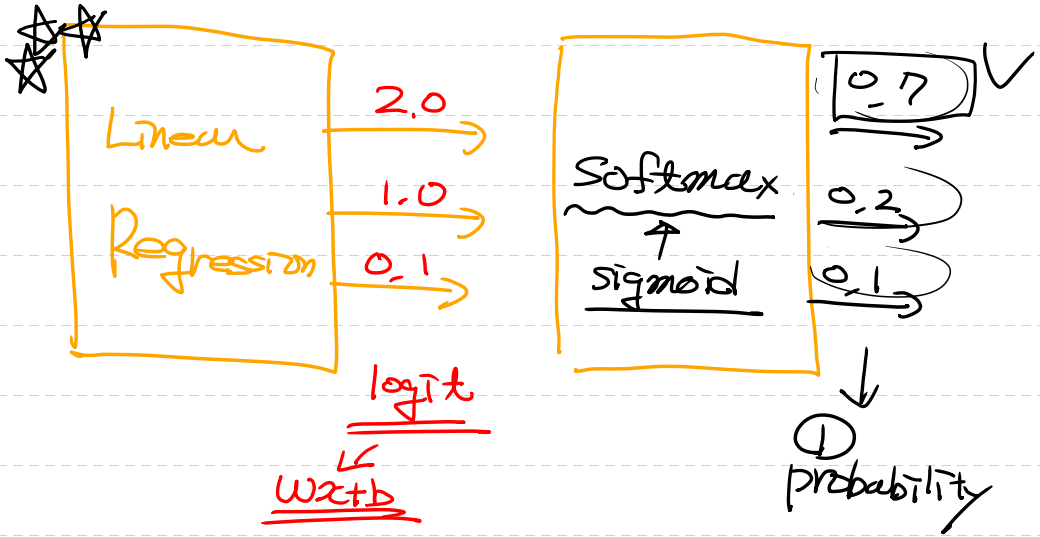

binary x
Multinomial (o)
Activation function
softmax
sigmoid
$\begin{pmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \\ x_{31} & x_{32} \\ \vdots & \end{pmatrix} \cdot \begin{pmatrix} w_{A1} & w_{B1} & w_{C1} \\ w_{A2} & w_{B2} & w_{C2} \end{pmatrix} + (b_A \; b_B \; b_C)$
$(n \times 2) \cdot (2 \cdot 3)$
① $y = \frac{1}{1+e^{-(wx+b)}}$
cross Entropy $= -\sum_{i=1}^{n} \{t_i \log(y_i) + (1-t_i)\log(1-y_i)\}$
$x_{11}w_{A1} + x_{12}w_{A2} + b_A$
$x_{11}w_{B1} + x_{12}w_{B2} + b_B$
$x_{11}w_{C1} + x_{12}w_{C2} + b_C$
A
B
C
0.7122
0.8385
0.2347
0.4
0.5
0.1
1

Softmax, $S(z)_j = \frac{e^{z_j}}{\sum_{n=1}^{k} e^{z_n}}$, $j = 0 \sim k$

Cross Entropy 는 $-\sum_{i=1}^{k} t_i \log(S(z)_i)$

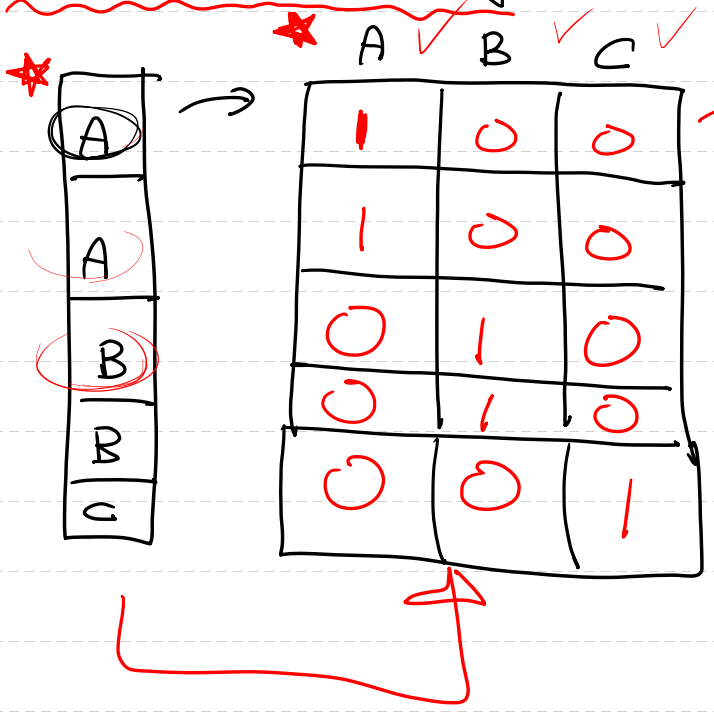
Sigmoid $= \frac{1}{1+e^{-x}}$

Cross Entropy $E(W,b) = -\Sigma$



One-hot Encoding

T → 입력 !!

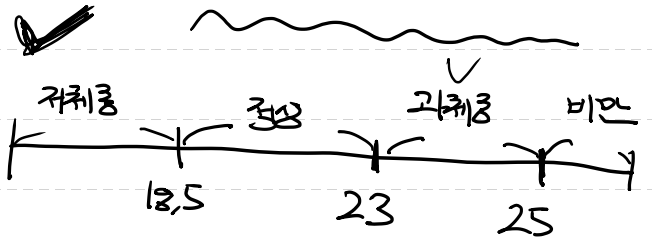


이 내용을 코드로 표현 !!!

BMI 예제

체질량지수(BMI) = 몸무게(kg) / (키(m))² = 70 / (1.8)² = ??

(비만, 과체중, 정상, 저체중)



X, T

키	몸무게	상태
180	70	0
170	50	1
150	100	2

0 : 과체중
1 : 정상
2 : 비만