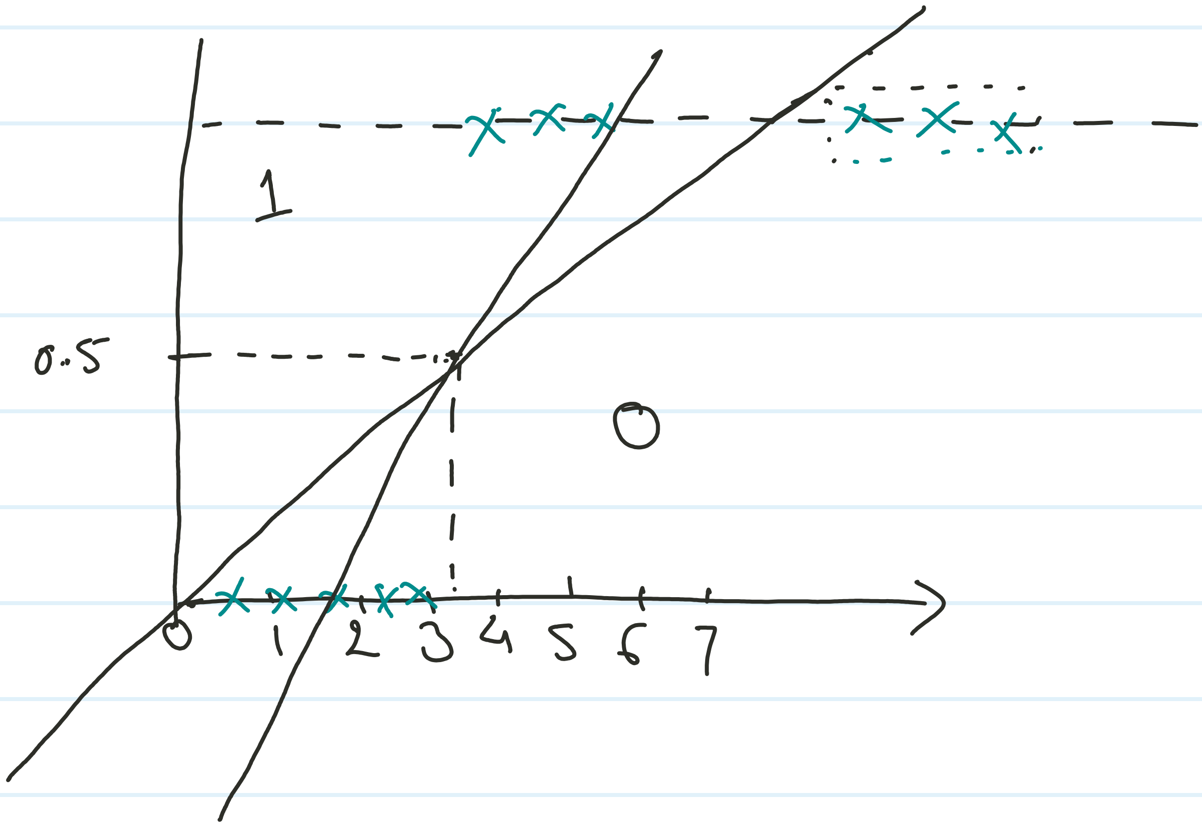
☆ Logistic Regression

classification supervised learning.



linear Regression $h_\theta(x) = \theta_0 + \theta_1 x_1$

In logistic Regression we will transform linear eqn into "sigmoid function"

step-I $\quad Z = h_\theta(x)$

$$z = \theta_0 + \theta_1 x_1$$

step - II

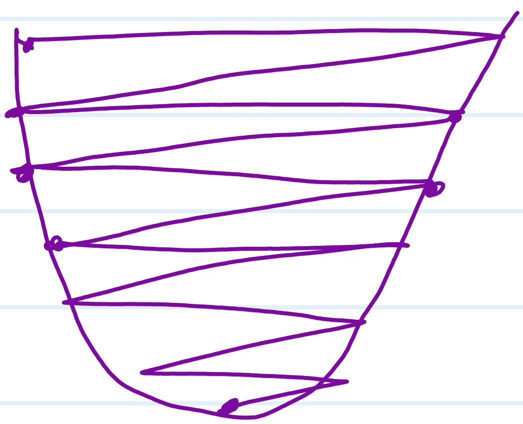
sigmoid function (σ) $= \dfrac{1}{1+e^{-z}}$

Always get value after applying this formula is 0 to 1.

linear cost function -

$$J(\theta_0, \theta_1) = \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x)^i - y^i)^2$$

This convex function.



logistic cost function -

$$J(\theta_0, \theta_1) = \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x)^i - y^i)^2$$

$$h_\theta(x) = \sigma(\theta_0 + \theta_1 x)$$

$$\sigma(z) = \sigma$$

$$\frac{1}{1+e^{-z}} = \frac{1}{1+e^{-(\theta_0+\theta_1 z)}}$$

Non convex function.

☆ log loss cost function -

$$\text{Cost}(h_\theta(x), y) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x))$$

$$\boxed{J(\theta) = -\frac{1}{m}\sum_{i=1}^{m} \text{cost}(h_\theta(x), y)}$$

Repeat conversion theorm

$$\theta_j = \theta_j - \alpha \frac{\partial}{\partial \theta_j} j(\theta_0, \theta_1)$$

α learning rate

θ_0 and θ_1 values change

Important Note about logistic Regression

① Logistic Regression can be binary and multiclass classification

binary = 1/0, T/F, P/F

multiclass = 1/2/3/4, m/f/T,

② Sigmoid function is key of logistic Regression

$$\sigma = \frac{1}{1+e^{-z}}$$

$$z = h_\theta(x) = \theta_0 + \theta_1 x_1$$

(3) Logistic Regression work well with binary class classification.

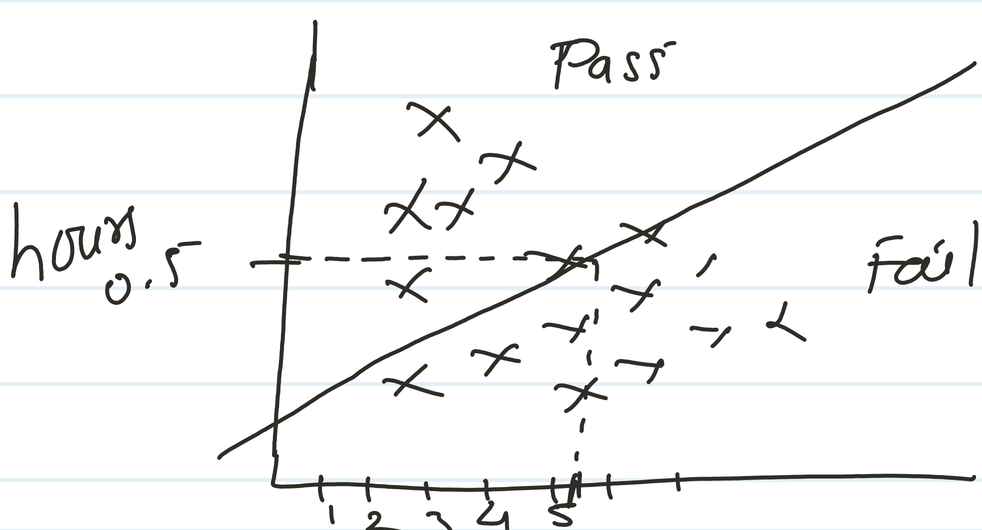
<u>Example</u> -

<u>student</u> → P/F, according to their study hours

2 study — F
6 study — P

<u>loan</u> ⇒ Pass / Reject

x_1	x_2	x_3	x_4	Y
f —	—	—	—	P
f —	f —	—	—	Reject.



actual

X_1	X_2	X_3	X_4	Y	$\hat{Y}$
1	2	3	4	F	P
5	6	7	8	P	P
9	10	11	12	P	F
13	14	15	16	F	F

0.75