Linear Regression in depth

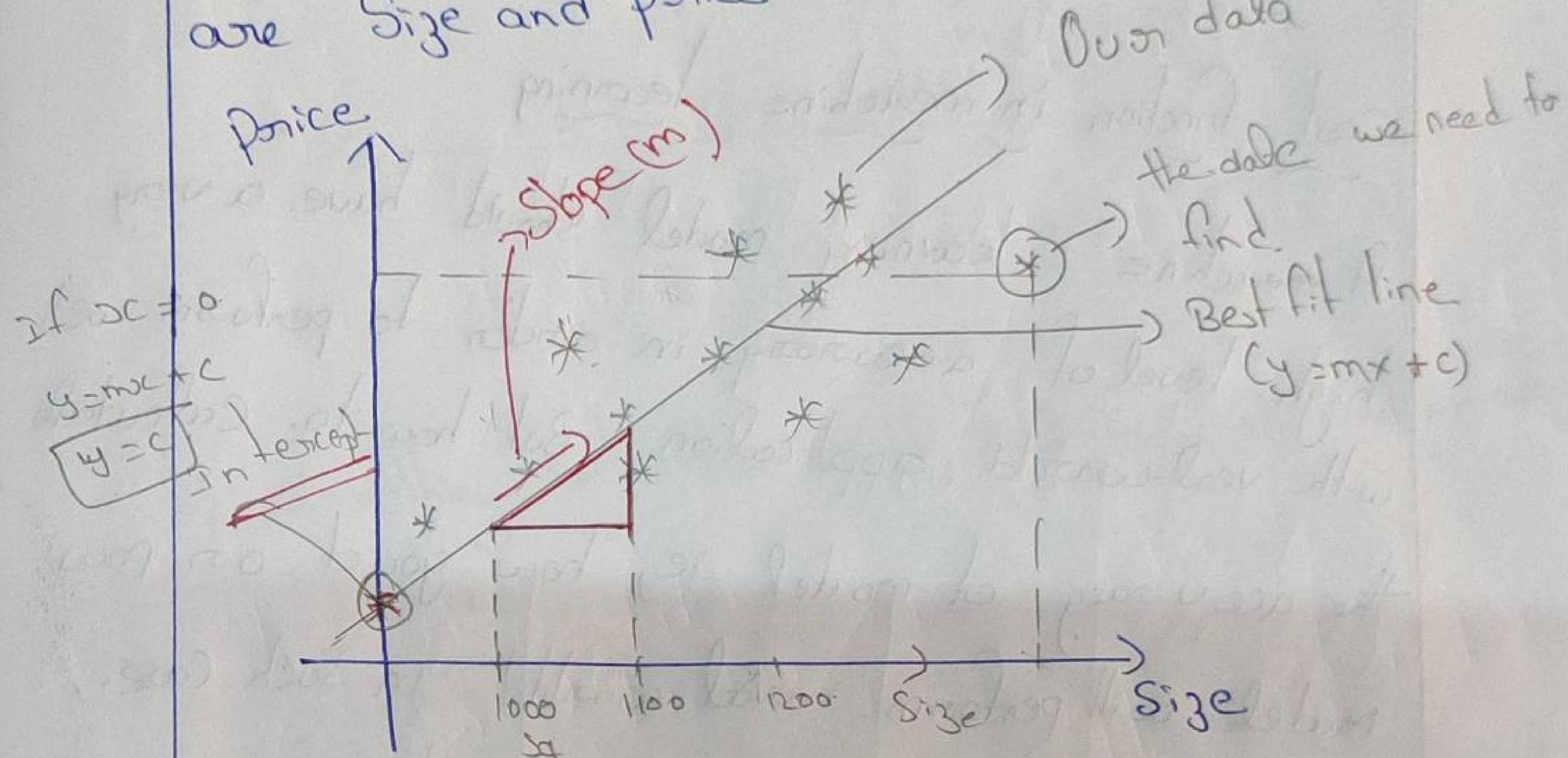
Maths Intution

$y = mx + c$ ⟶ Best fit line

m = slope

c = intercept (or) constant

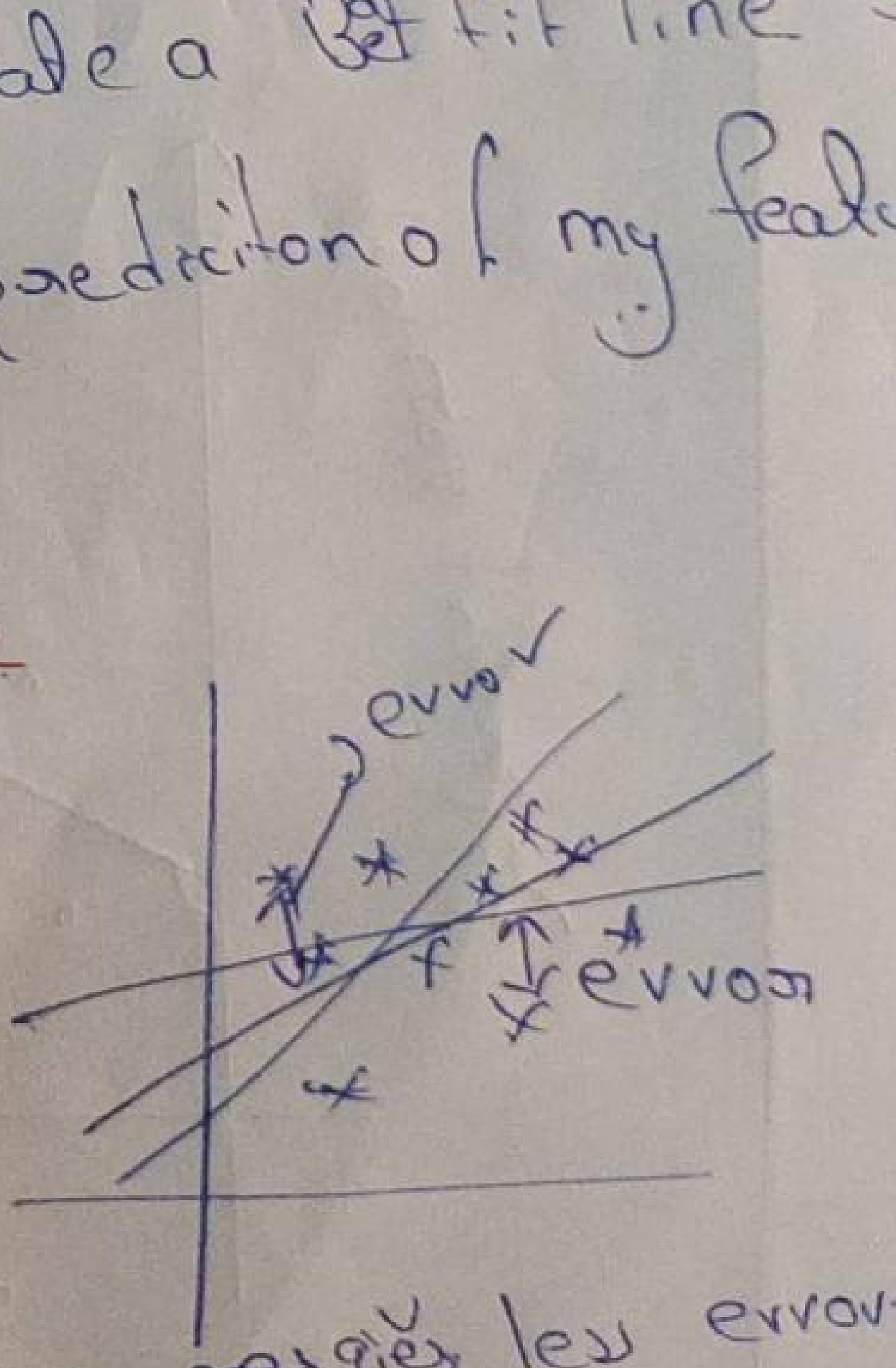
~~wha~~ Think we have a dataset with 2 features there are Size and price

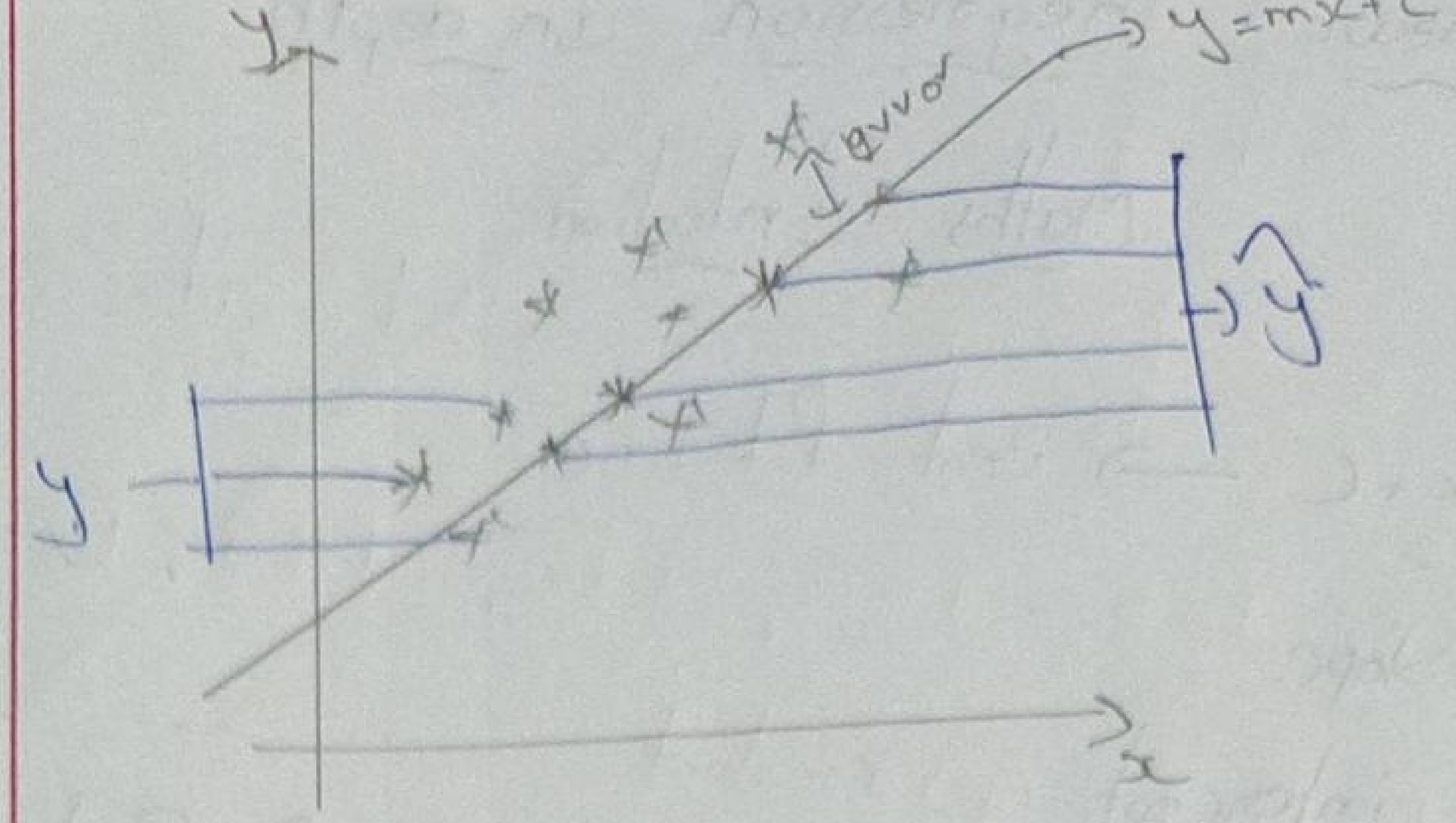


we ~~are~~ doing By Regression line. (or) Regression agorithm to create a Best fit line such this best ~~line~~ fit line does prediciton of my feature Size.

How we can fit the Best fit line

we can draw multpi lines also and we can try (cost) to mins the error and we will add all the error and which best line ~~gets~~ gies less error that value is called minimal Error

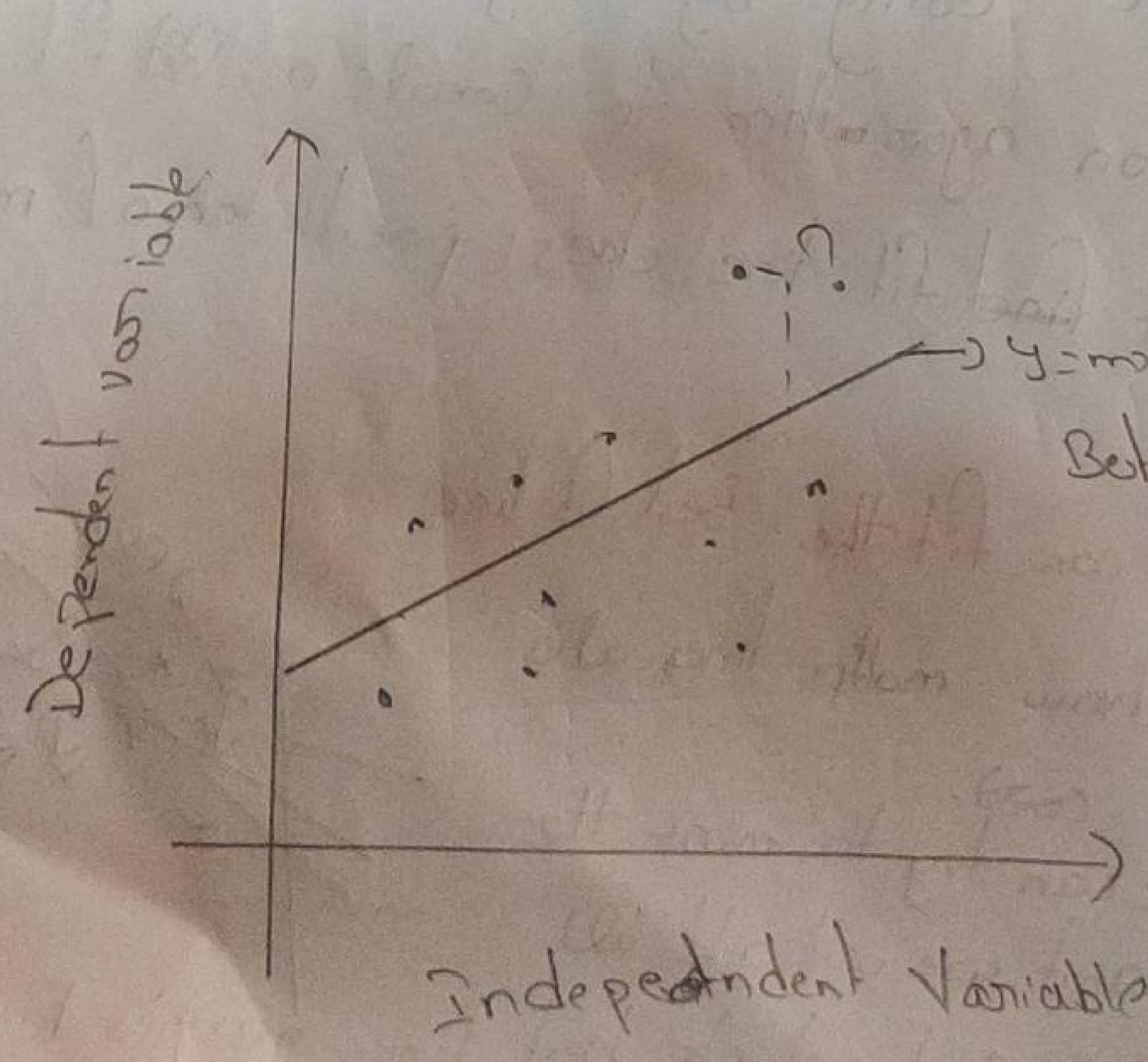




To get the Best fit line.. we use the Cost function.

Cost function in meachine learning

A meachine learning model should have a very high level of accuracy in order to perform well with real-world application. But how to calculate the accuracy of model ie, how good or poor model will perform in real world! in such case, the cost function comes in existence.



Cost function also plays a crucial role in understanding that how well your model exstimate the relationship between the input and output parameters

$$\text{Cost function} = \frac{1}{2n} \sum_{i=1}^{n} (\hat{y} - y)^2$$

Basically we need to minimze the cost function

$\hat{y} = mx + c$

$y = mx + c$ — ①

$\hat{y}$ is nothing but the point that you are findout at best fit line

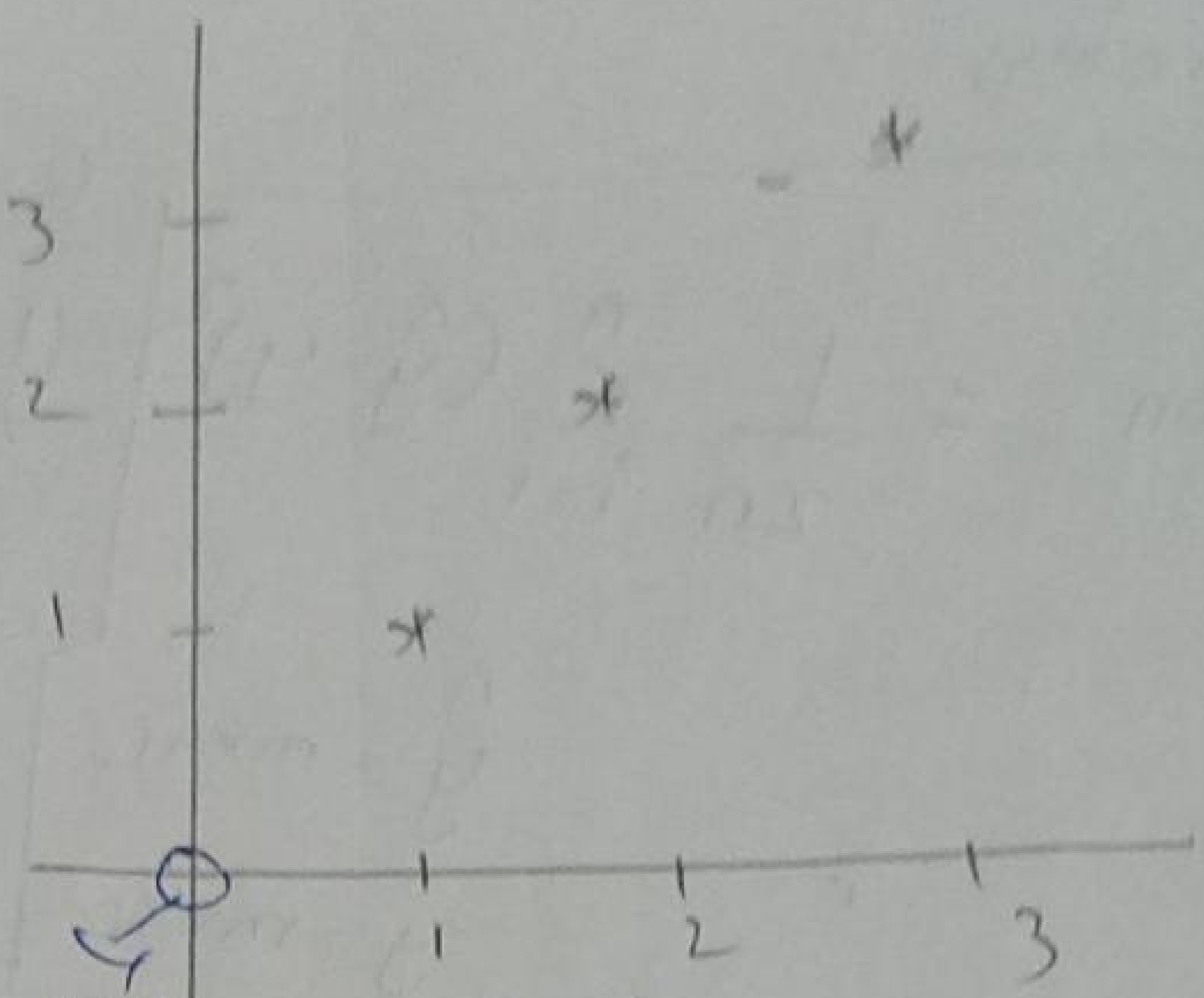
y is nothing but real point

Now

By using the eq ① How we can find the best fit? we can have multip best fit right and we need to comput all the sum of y that is not a correct way it will take so much of time to do.

the Best way was

$\boxed{y = x}$ — ①



$c = 0.$

If c is passes though origin.

Now weneed to find the best fit line.

$\hat{y} = mx + c \rightarrow$ if $\boxed{c = 0}$

$\hat{y} = mx$ — ②

$\boxed{m = 1}$

If $\boxed{x = 1}$

$\hat{y} = 1 \times 1.$

$\hat{y} = 1$

$x = 2$

$\hat{y} = 1 \times 2$

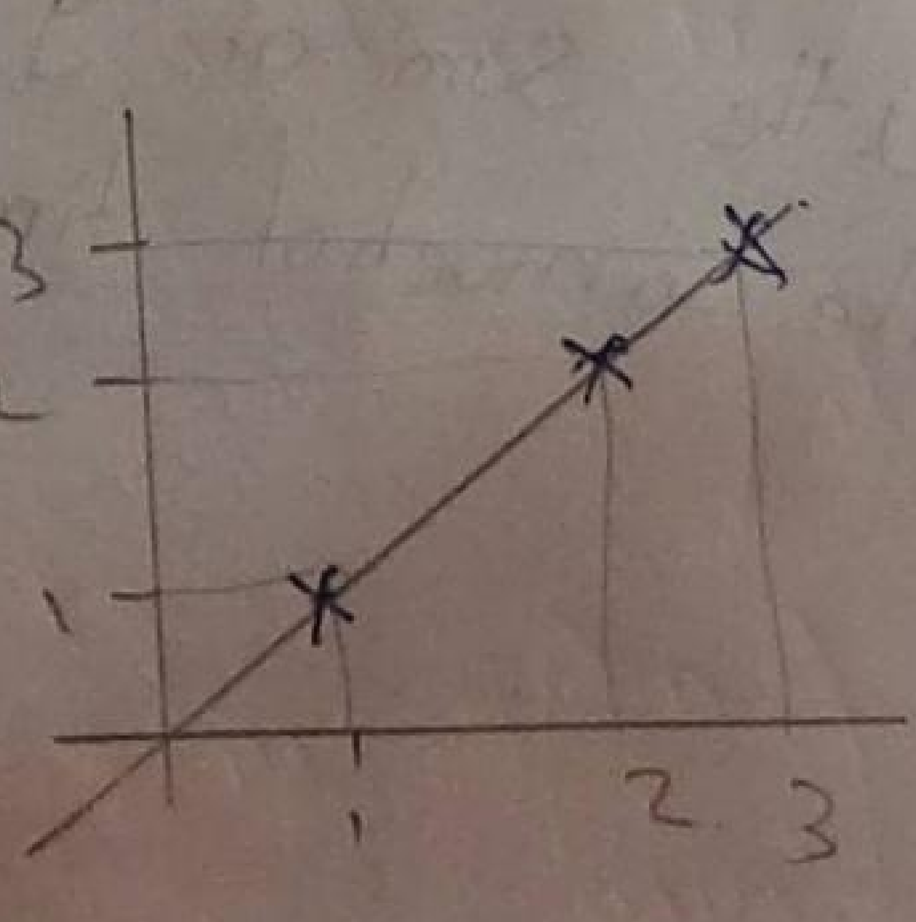
$\hat{y} = 2$

$x = 3$

$\hat{y} = 1 \times 3$

$\hat{y} = 3$

∴ the ~~the~~ Best fit line lookes like.



$m = 1$

we know the Cost function is

$$\text{Cost function} = \frac{1}{2n}\sum_{i=1}^{n}(\hat{y} - y)^2$$

$\hat{y}$ = Best fit line value, y = real value

$$= \frac{1}{2(3)}\left((1-1)^2 + (2-2)^2 + (3-3)^2\right)$$

$$\Rightarrow \frac{0}{6}$$

$$\boxed{\text{Cost function} \Rightarrow 0.}$$

if $m = 0.5$

$\hat{y} = mx + c \rightarrow \boxed{c = 0}$

$\hat{y} = mx$

If $\boxed{x = 1}$

$\hat{y} = 0.5 \times 1$

$\hat{y} = 0.5$

$\boxed{x = 2}$

$\hat{y} = 0.5 \times 2$

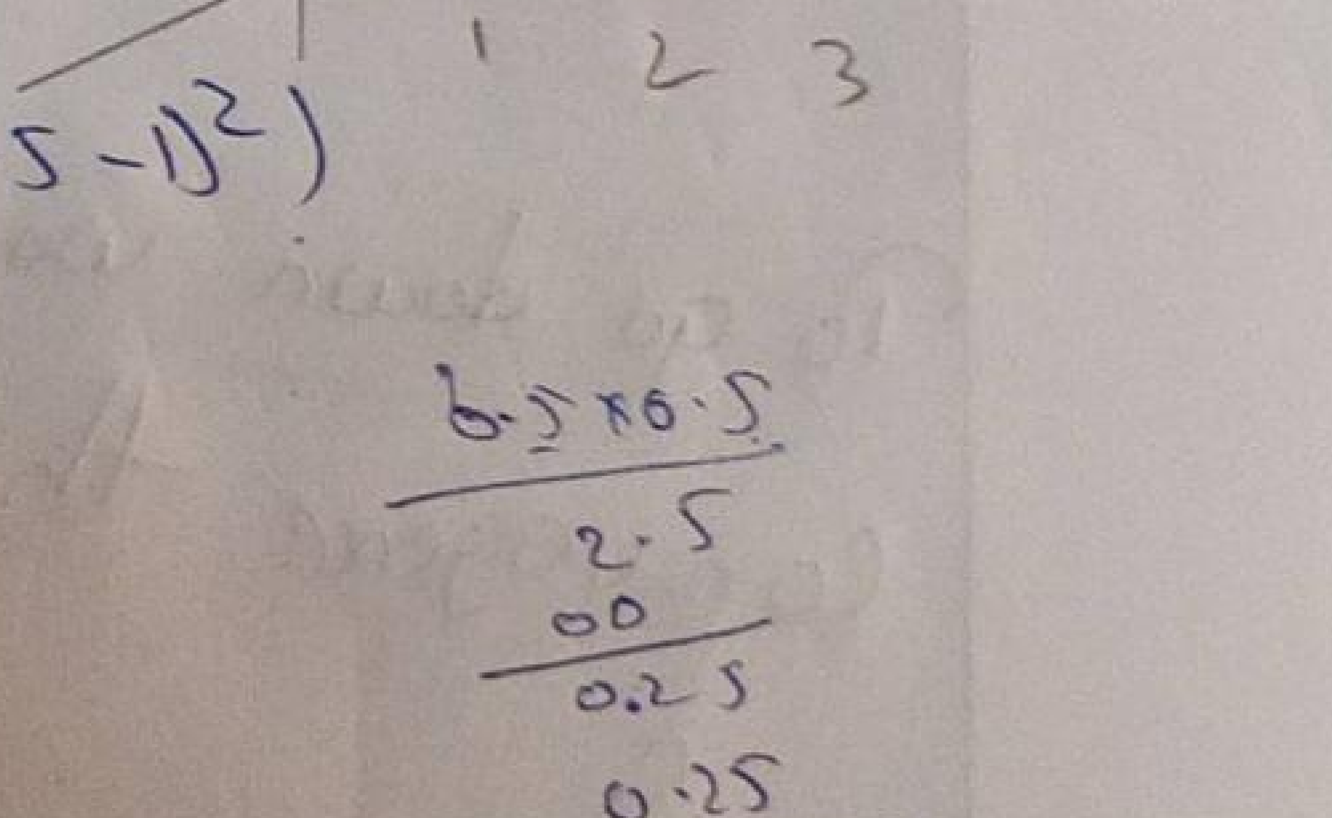
$\hat{y} = 1$

$\boxed{x = 3}$

$\hat{y} = 0.5 \times 3$

$\hat{y} = 1.5$

∴ the Best fit line is look like.



we know cost function is

$$\text{Cost function} = \frac{1}{2n}\sum_{n=1}^{n}(\hat{y} - y)^2$$

$$= \frac{1}{2(3)}\left((0.5-1)^2 + (1-1)^2 + (1.5-1)^2\right)$$

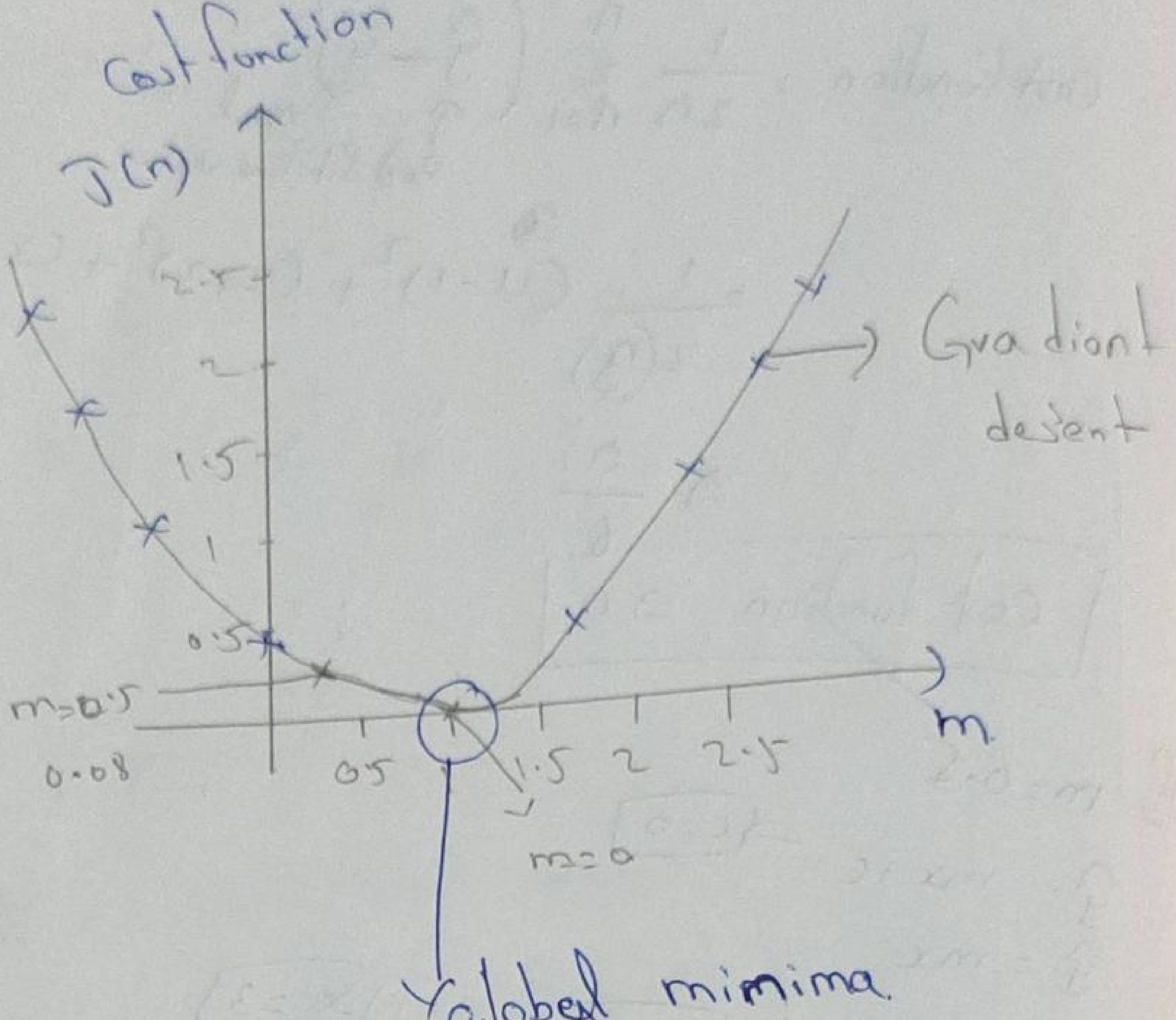
$$\Rightarrow \frac{(0.5)^2 + 0 + (-0.5)^2}{6}$$

0.5×0.5
2.5
00
0.25
0.25
0.50

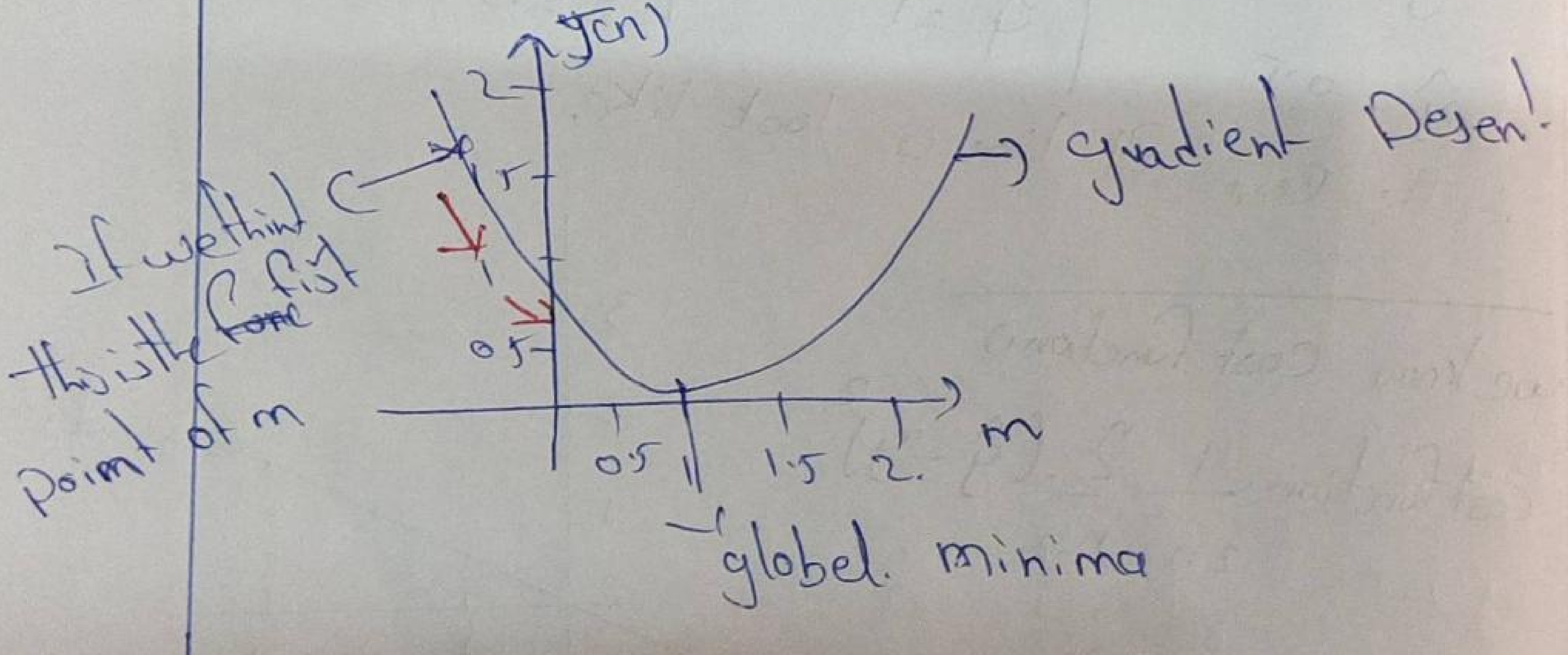
$$\Rightarrow \frac{0.5}{6.}$$

$$\Rightarrow 0.0833 \Rightarrow 0.08$$

Like that will do for all the "m" values in the graph.



How to get the global minima.



To go down word we use the thevom called convengence theorem

slope

$$\left\{ m = m - \left(\frac{\partial m}{dm}\right) \times \alpha \right\}$$

→ learning Rate