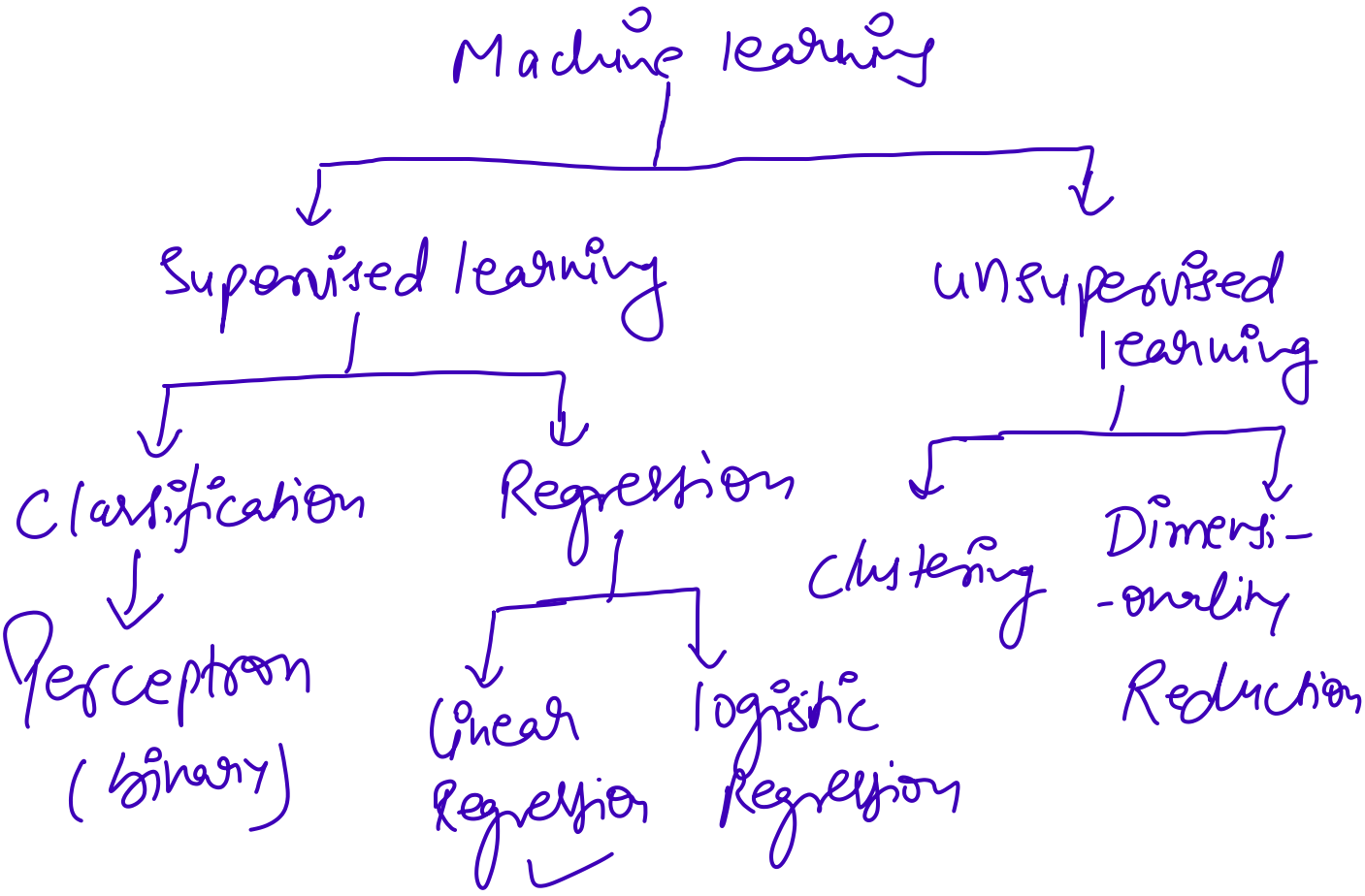
15/11/2021



Regression (Real-valued function)
(Prediction) (Continous Data)

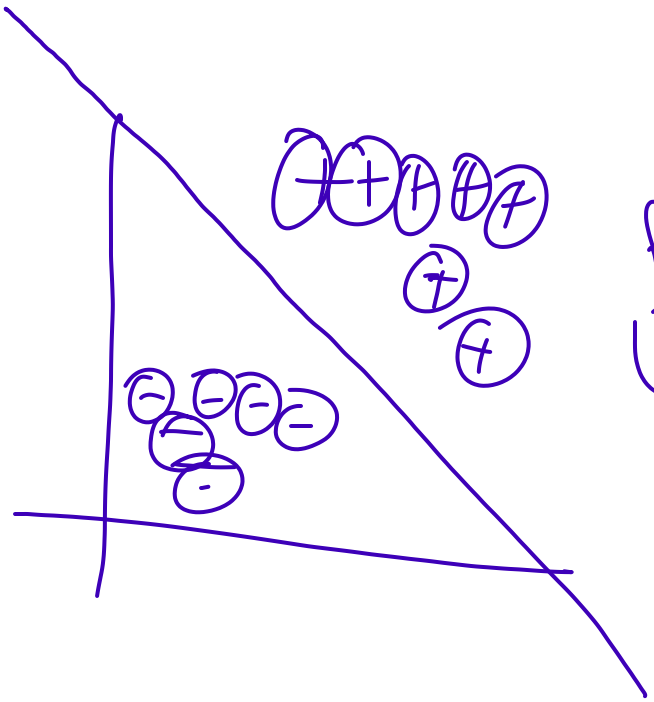
↳ House price prediction

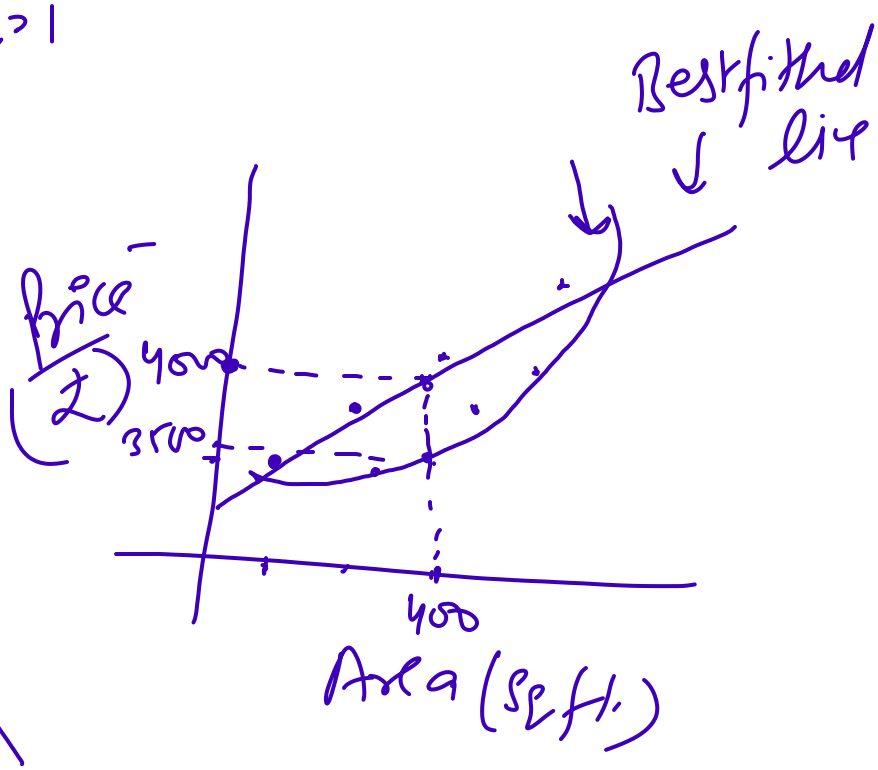
training set

	X	Y
	Area (sq.ft)	Price
1	100	1500 ₹
2	200	2500 ₹
3	900	10000 ₹
4	600	6500 ₹
5	300	7500 ₹

what will be the price for 400 sqft. (Testing data)

$(X_i, Y_i)_{i=1}^{n}$



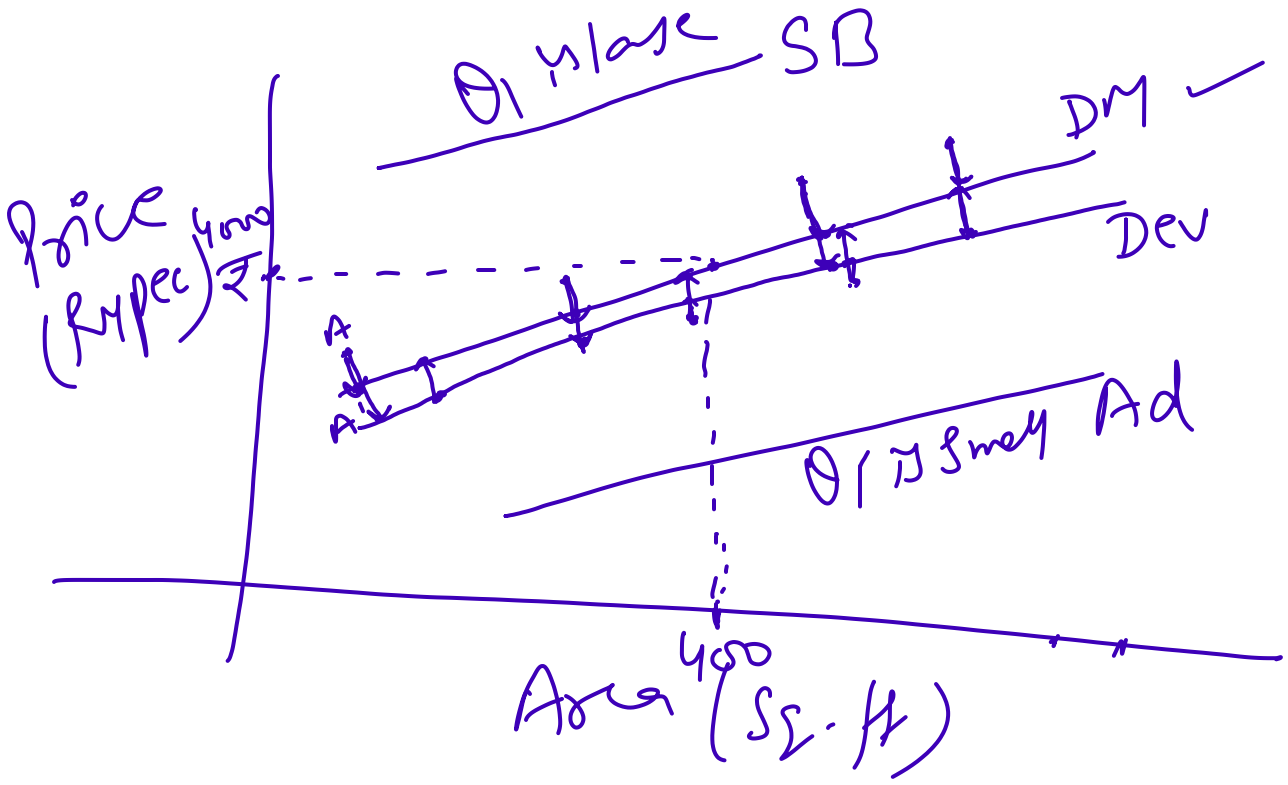


Curve → Polynomial Regression

Line → Linear Regression

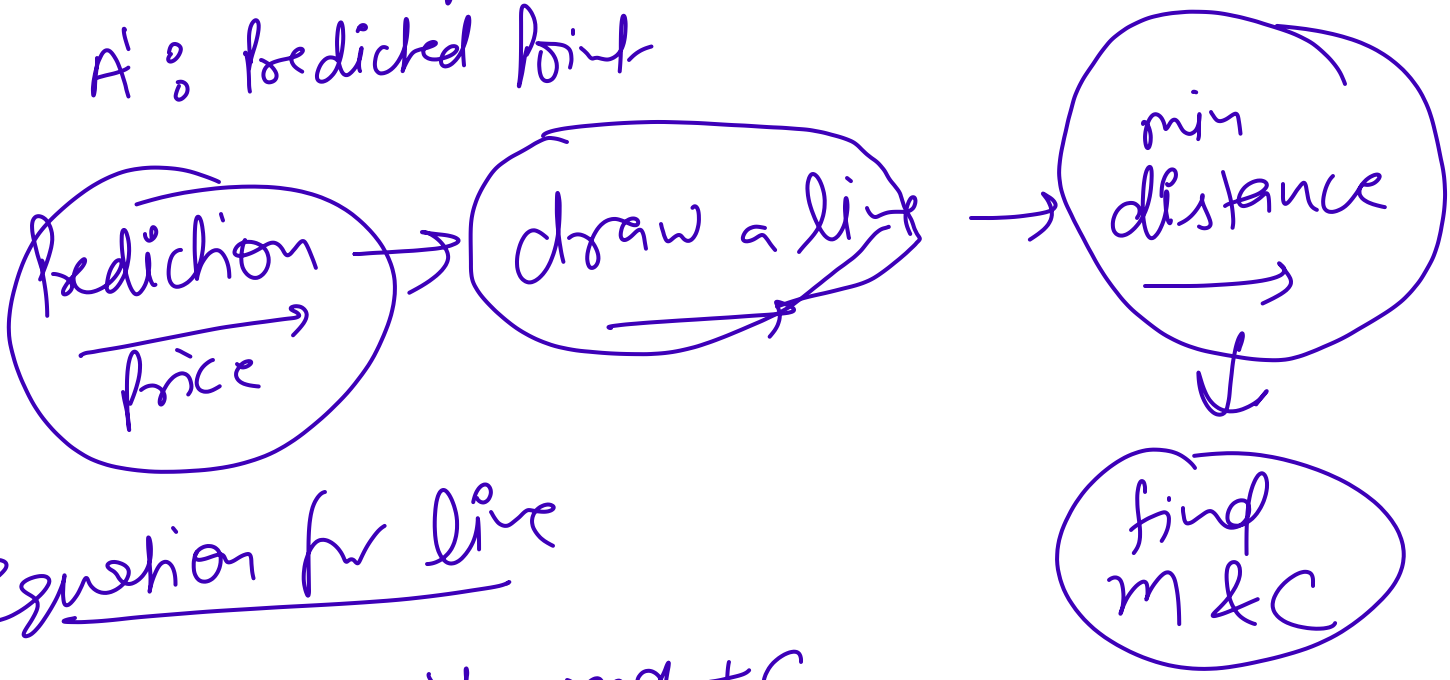
Linear Regression :-

1) Build the Model
2) Draw the line
3) Best fitted line which will try to all the training data points.



A : actual point

A' : predicted point



Equation for line

$y = mx + C$

400

To find m & C

Predicted Price

m : slope of line

C : intercept

* No, this line will not give 100% guarantee to get the best prediction.

* Two functions is used for linear Regression

(1) Hypothesis function $h_\theta(x)$

(2) Cost function $J(\theta_0, \theta_1)$

$h_\theta(x) = mx + c$

θ_1 : intercept

θ_0 : slope

$$\boxed{h_\theta(x) = \theta_0 x + \theta_1}$$

eg θ_0, θ_1 ✓ ✓

$\theta_0 = 1$ ✓

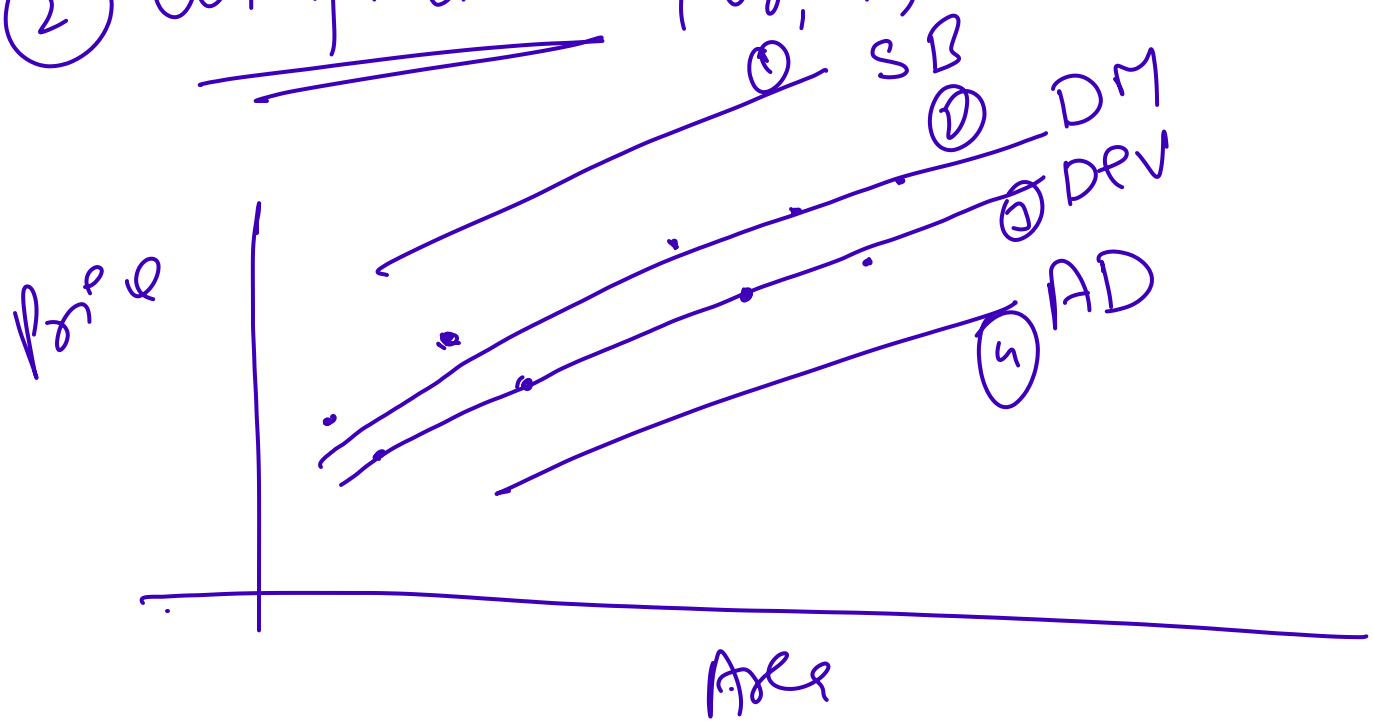
$\theta_{01} = 0$ ✓

$h_\theta(x) = 1 \times x + 0$

$$\boxed{h_\theta(x) = x}$$

ideal case

(2) Cost function (θ_0, θ_1)



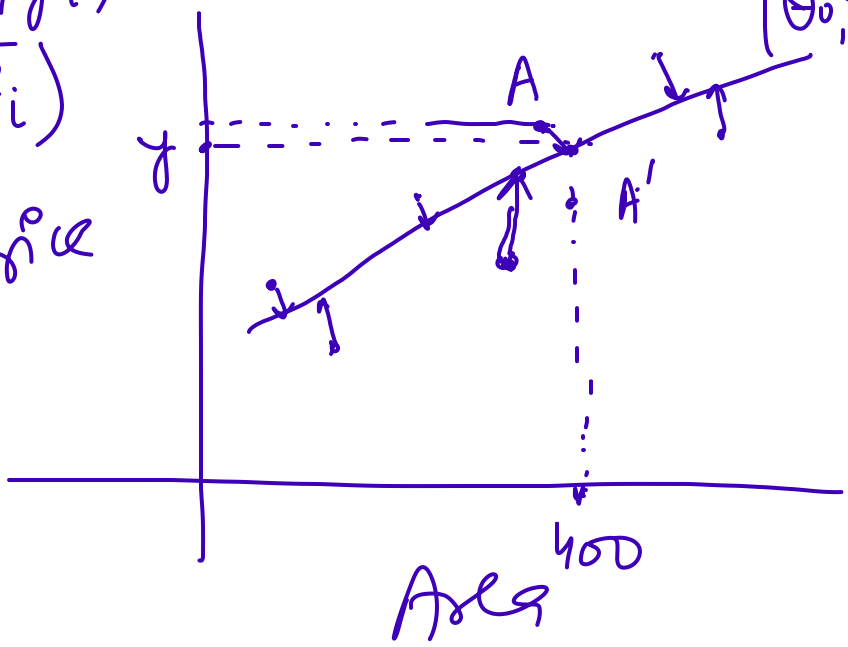
Mean Squared distance

Cost function for linear Regression

A: Actual point (x_i, y_i)

A': Predicted point $(x_i, \bar{y}_i)$

$(\bar{y}_i - y_i)$ +ve, -ve



$$J(\theta_0, \theta_1) = \frac{1}{2n} \sum_{i=1}^{n} (\bar{y}_i - y_i)^2$$

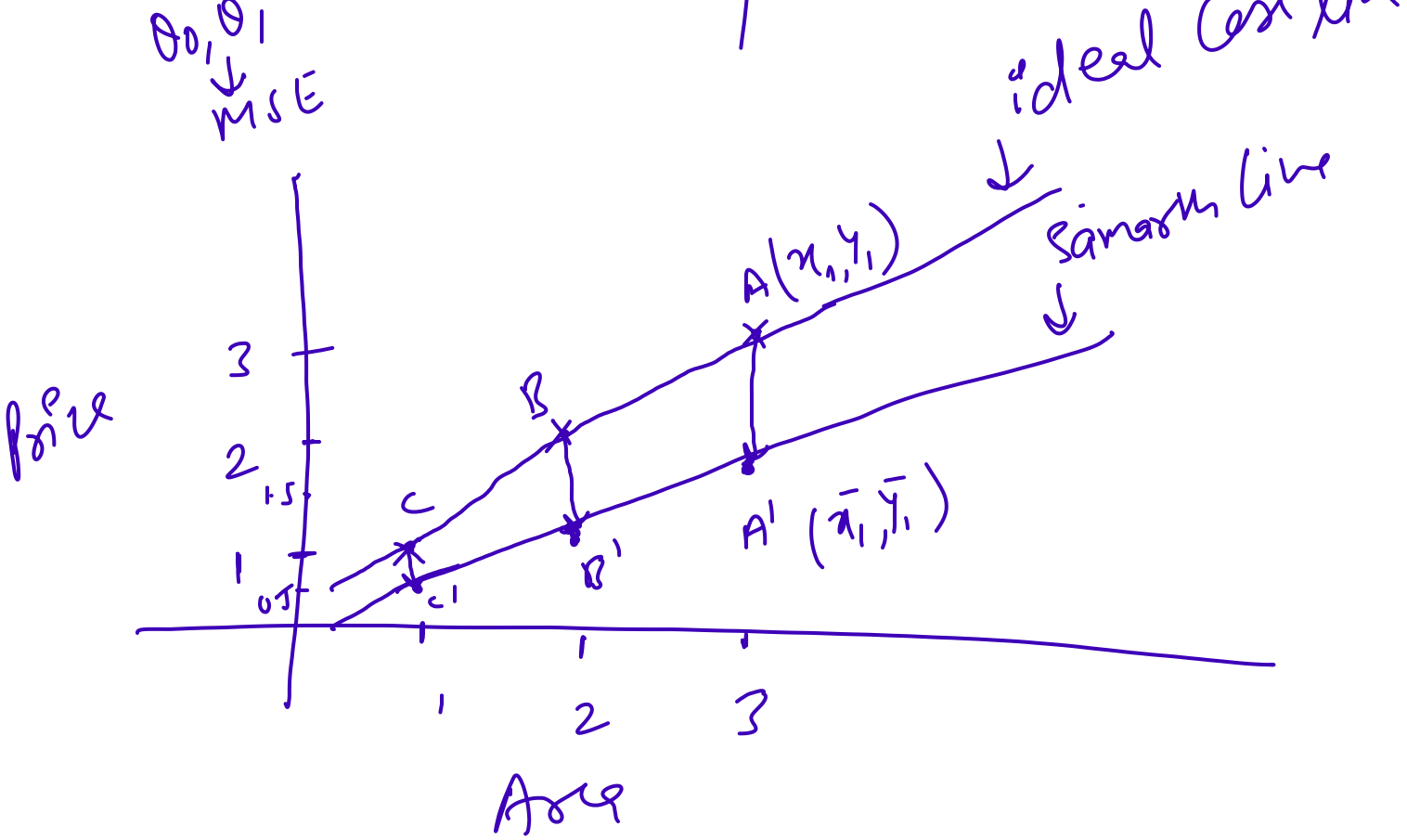
(MSE)

$$\bar{y}_i = h_\theta(x) = \theta_0 x + \theta_1$$

ex (Testing data)

	x (Area (Sq.ft))	y (Price (₹))
x_1	1	1
x_2	2	2
x_3	3	3

4 steps
↓
Draw line
↓
θ_0, θ_1
↓
MSE



Case 1°:-

$\theta_0 = 0.5$

$\theta_1 = 0$

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

$$= 0.5x + 0$$

$$h_\theta(x) = 0.5x$$

$x_1 = 1$, $h_\theta(1) = 0.5$, $(1, 0.5)$

$x_2 = 2$, $h_\theta(2) = 0.5 \times 2$, $(2, 1)$

$x_3 = 3$, $h_\theta(3) = 0.5 \times 3$, $(3, 1.5)$

Cost function

$$J(\theta_0, \theta_1) = \frac{1}{2n} \sum_{i=1}^{n} (\bar{y_i} - y_i)^2$$

$n = 3$
$\theta_0 = 0.5$
$\theta_1 = 0$

$$= \frac{1}{2 \times 3} \sum_{i=1}^{3} (h_\theta(x) - y_i)^2$$

$$J(0.5, 0) = \frac{1}{6} \sum_{i=1}^{3} (h_\theta(x) - y_i)^2$$

$$J(0.5, 0) = \frac{1}{6}\left[(0.5 \times 1 - 1)^2 + (1 - 2)^2 + (1.5 - 3)^2\right]$$

$$= \frac{1}{6}\left[(-0.5)^2 + (-1)^2 + (-1.5)^2\right]$$

$$= 0.58$$ ✓

Provided Con

$\theta_0 = 1$

$\theta_1 = 0$

$h_\theta(x) = x$

$x = 1, \quad h_\theta(1) = 1 \quad (1, 1)$

$x = 2 \quad h_\theta(2) = 2 \quad (2, 2)$

$x = 3 \quad h_\theta(3) = 3 \quad (3, 3)$

$$J(1, 0) = \frac{1}{2 \times 3} \sum_{i=1}^{3} (1-1)^2 + (2-2)^2 + (3-3)^2$$

$$= 0$$ ✓

Cost 2

$\theta_0 = 0$

$\theta_1 = 0.5$

G.D