Co-ordinate Geometry Tue

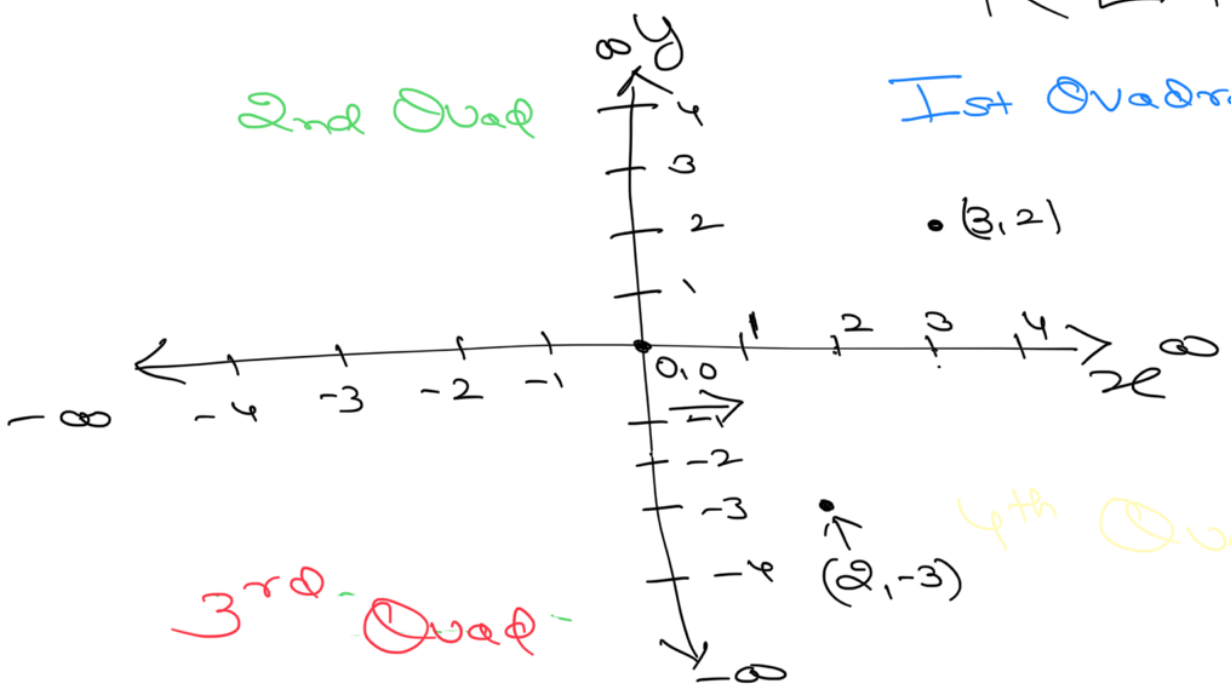
1) Distance
2) Slopes

80% Classical ML

and DL Algo

Deep learning

RL + DL

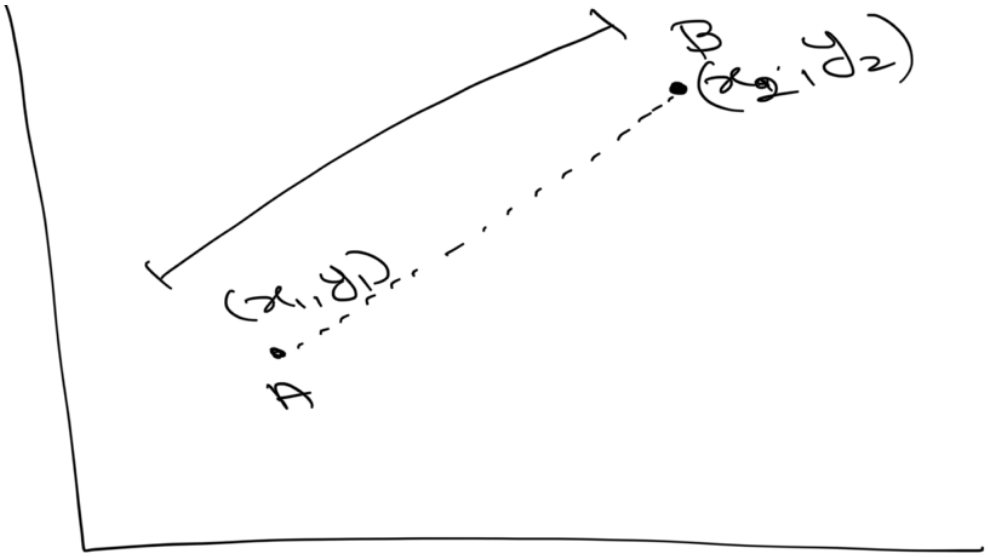


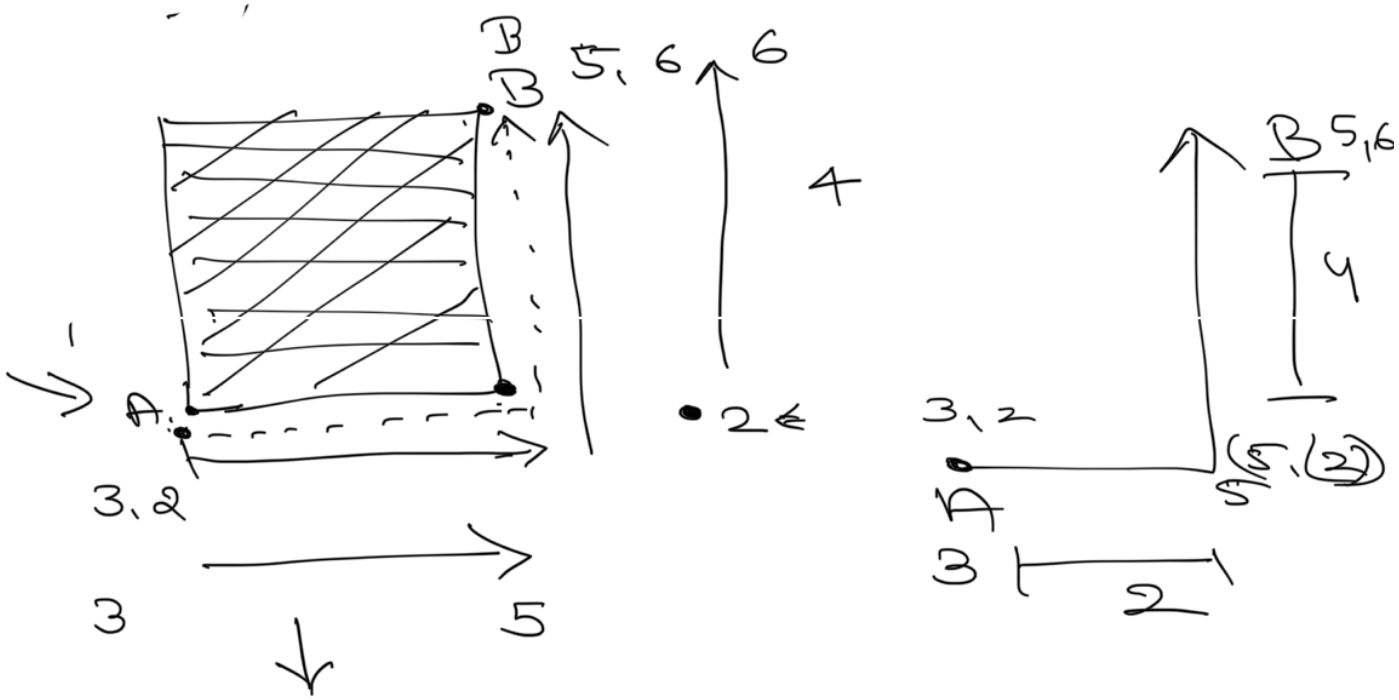
Cartesian Plane → 2d Plane

→ Plot (3,2)

→ Where will point (2,-3)

Distance between two point





L1 distance or Manhattan Distance

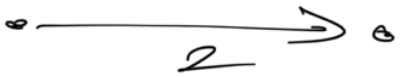
$$\left|x_2 - x_1\right| + \left|y_2 - y_1\right|$$

$2 + 4$

6 units

$5 - 3 \Rightarrow 2$

$3 - 5 \Rightarrow |-2| \Rightarrow 2$



$|3| \Rightarrow 3$

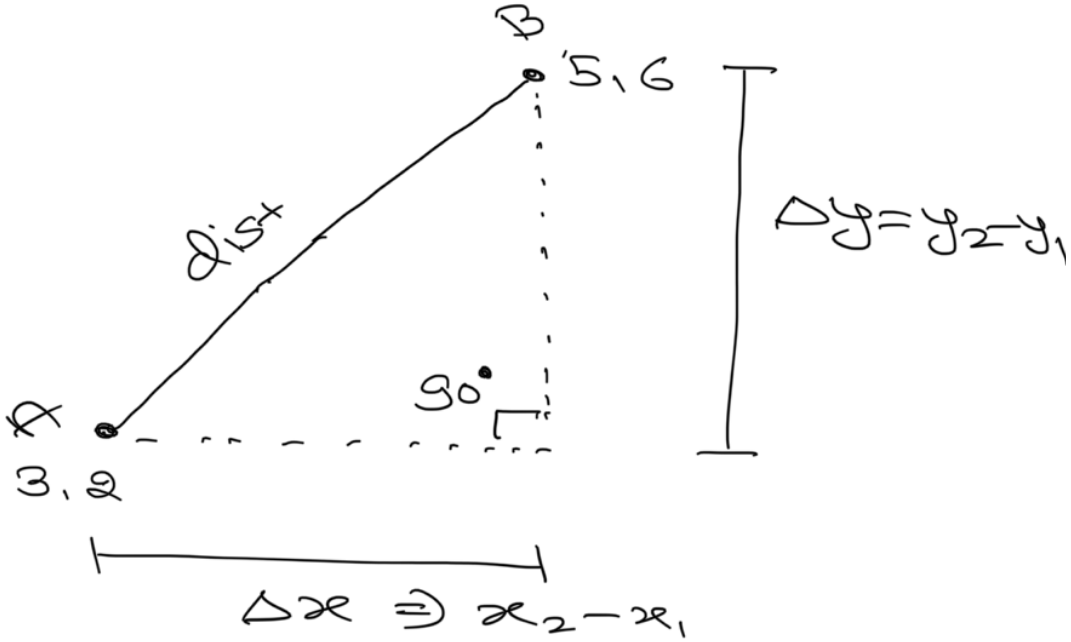
$|-3| \Rightarrow 3$

$\because$ ← Remains

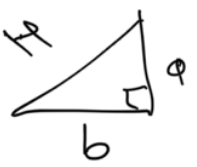
$|| \Rightarrow$ Positive

(2) L2 Distance

Euclidean Distance



$$d^2 \Rightarrow \Delta x^2 + \Delta y^2$$



$H^2 \Rightarrow a^2 + b$

$d \Rightarrow \sqrt{\Delta x^2 + \Delta y^2}$

$d \Rightarrow \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$(3, 2)$
$(5, 6)$

$\Rightarrow \sqrt{(5-3)^2 + (6-2)^2}$

$\Rightarrow \sqrt{2^2 + 4^2}$

$\Rightarrow \sqrt{4 + 16} \Rightarrow \sqrt{20}$

$\Rightarrow 2\sqrt{5}$

Euclidean distance or L2 dist

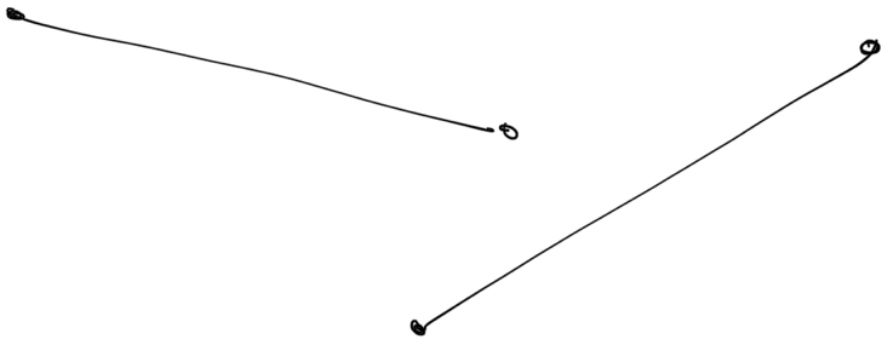
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Any 2 point
- L1 distance / Manhattan
- L2 distance / Euclidean

→ Two points will always form

of line

→ Two points are always Collinear



→ Equation of Line

$$y = mx + c$$

m → Slope

c → y-intercept

$$y = 3x - 10 \rightarrow 3x + (-10)$$

Slope = 3

y-intercept → −10

→ y-intercept → The value of

y-Coordinate where line crosses y-axis ($x = 0$)

Slope = Change in value of y if we change x by 1 unit

⇒ $\Delta y \Rightarrow y_2 - y_1 \Rightarrow 2 - 4$

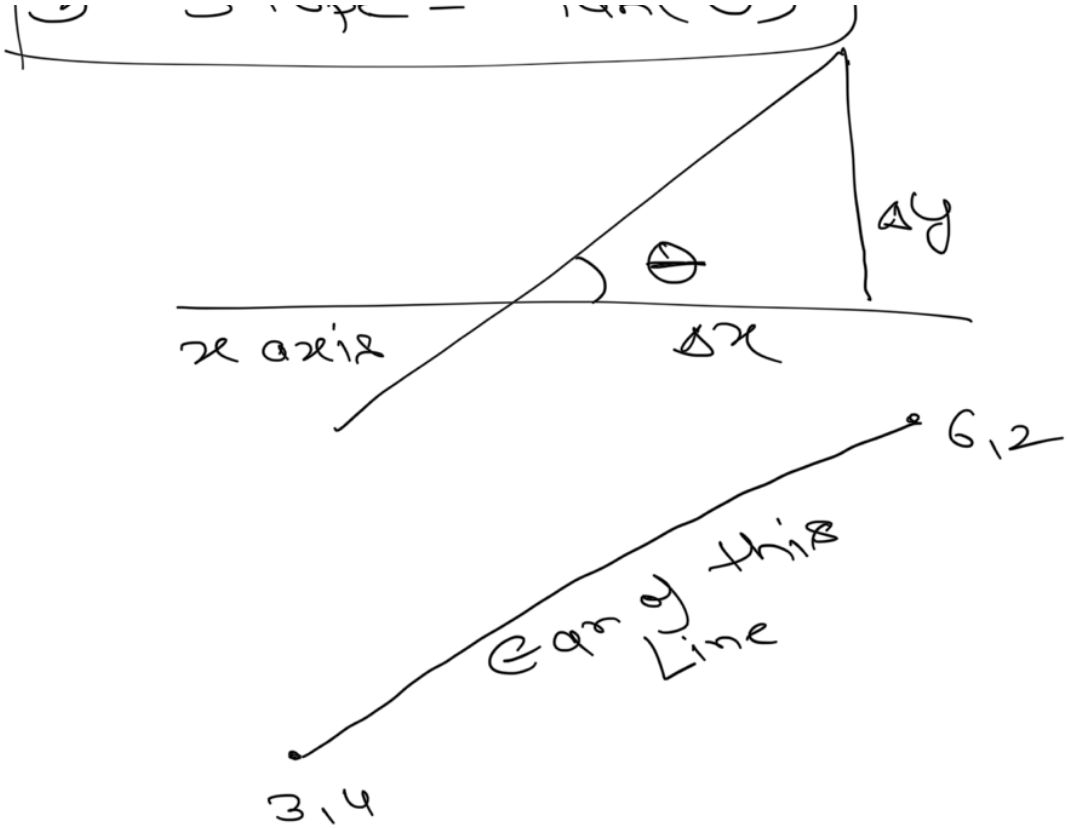
⇒ $\Delta x \Rightarrow x_2 - x_1 \Rightarrow 6 - 3$

Total Change y / Total Change x ⇒ $\frac{\Delta y}{\Delta x} \Rightarrow \frac{y_2 - y_1}{x_2 - x} \Rightarrow \frac{-2}{3}$

⇒ Average Rate of Change

⇒ Gradient

⇒ Slope = $\tan(\theta)$



$$y = mx + c$$

$$y = \frac{-2}{3}x + c$$

?c

Quizzes

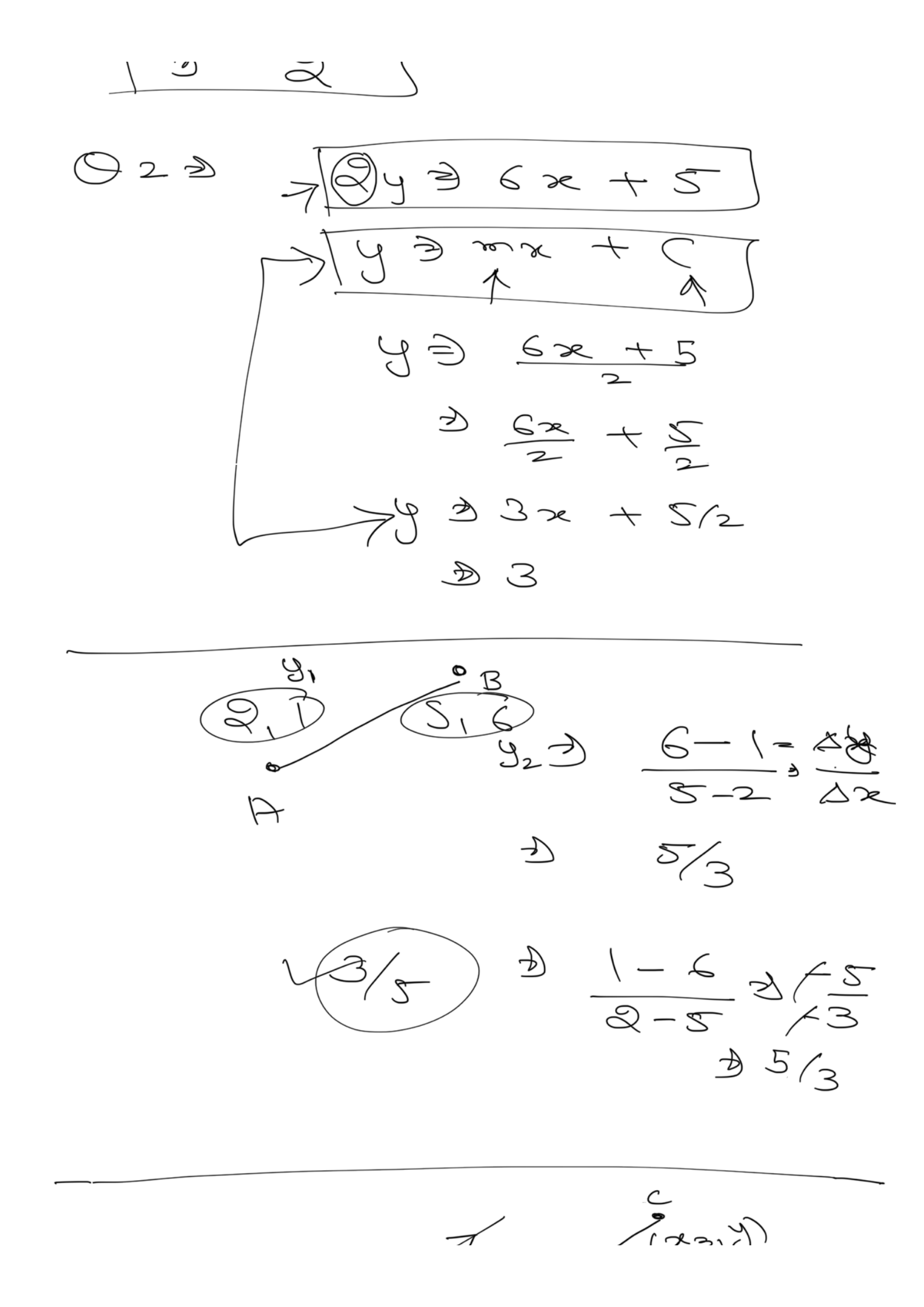
1)

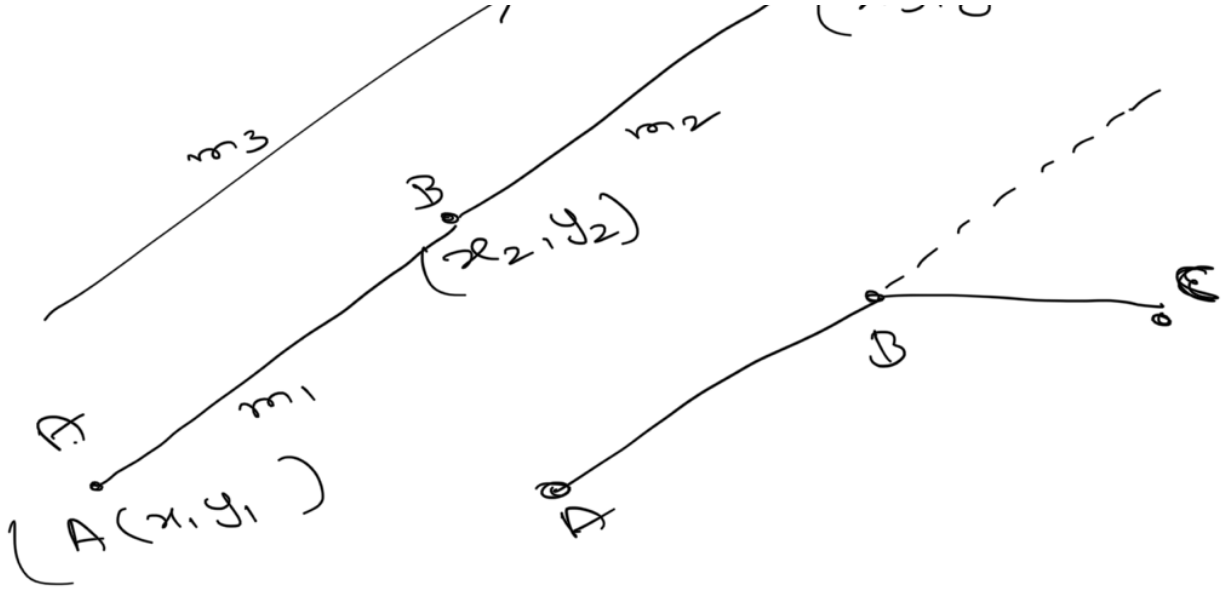
(3, 4) x_1, y_1 (2, 3) x_2, y_2

2) $|x_2 - x_1| + |y_2 - y_1|$

3) $|2 - 3| + |3 - 4|$

4) $|-1| + |-1|$


Q 2 ⇒
y ⇒ 6x + 5
y ⇒ mx + c
y = (6x + 5)/2
⇒ 6x/2 + 5/2
y ⇒ 3x + 5/2
⇒ 3
A
B
Q1, 1
S, 6
y1
y2 ⇒
6 − 1 / 5 − 2 ⇒ Δy/Δx
⇒ 5/3
3/5
⇒ 1 − 6 / 2 − 5 ⇒ −5/−3
⇒ 5/3
C
(x3, y)



Slope(AB) = S(BC) = Slope(AC)

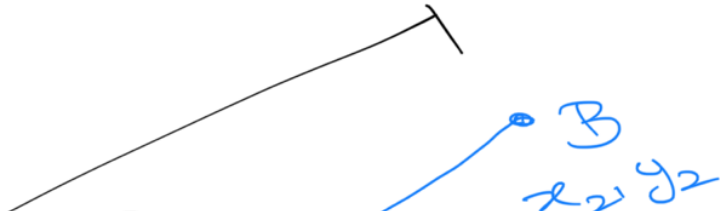
$m_1 = m_2$

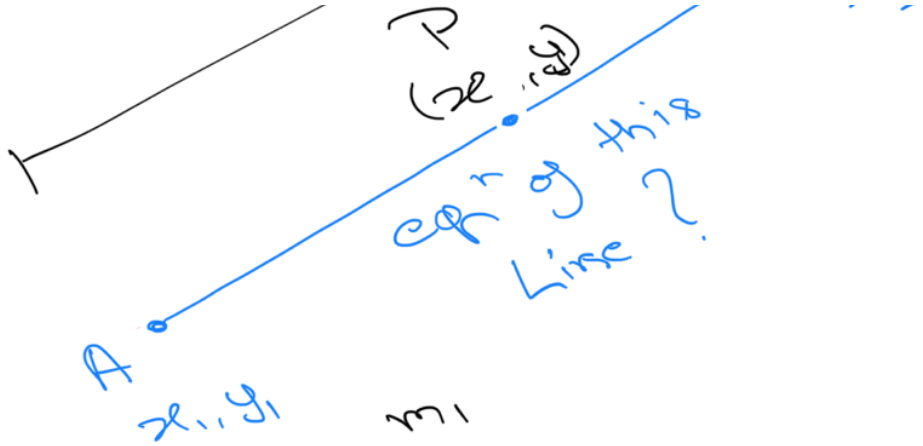
$m_1 = m_3$

$m_2 = m_3$

← Collinear or Not 2

To derive 2 point form Eqn





$$AP = PB = AB$$

$$AP \Rightarrow \frac{y - y_1}{x - x_1} \qquad (i)$$

$$AB \Rightarrow \frac{y_2 - y_1}{x_2 - x_1} \qquad (ii)$$

$$AP = AB$$

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\boxed{y - y_1 = \left(\frac{y_2 - y_1}{x_2 - x}\right) \times (x - x_1)}$$

Slope
and intecept

A (2, 1) ⇒ B (5, 6)
$x_1 \quad y_1 \quad x_2 \quad y_2$

$$y - 1 = \left(\frac{6-1}{5-2}\right) \times (x - 2)$$

$$y - 1 = \frac{5}{3} \times (x - 2)$$

$$y - 1 = \frac{5x}{3} - \left(\frac{10}{3}\right)$$

$$y = \frac{5x}{3} - \left(\frac{10}{3} + 1\right)$$

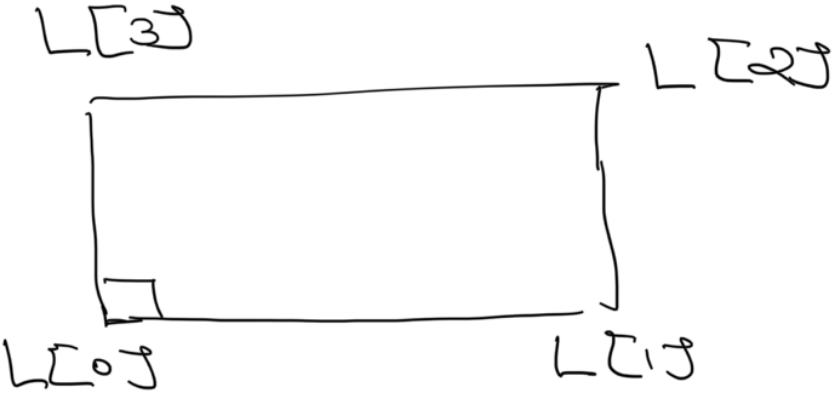
$$= \frac{5x}{3} - \frac{10+3}{3}$$

$$= \frac{5x}{3} - \frac{7}{3}$$

$$y = mx + c$$

H.W Question ①

List = [(1,2), (3,4), (5,6), (9,10)]



Hint : Distances

Q-2

Given two points A and B calculate and return the slope and intercept

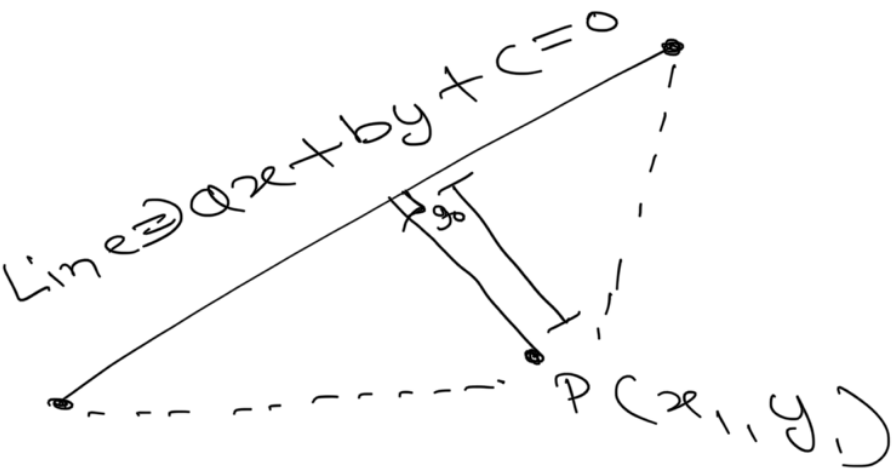
Input : A (1,1)
B (2,3)
→ line

Output → (Slope, intercept)

$\begin{vmatrix} 3 & 4 \\ 0 & 3 \end{vmatrix} = 9$

$\begin{vmatrix} 4 & 3 \\ 3 & 2 \end{vmatrix} = 1$

Distance of a point from Line



$ax + by + c$

Shortest distance of line from point $P(x_1, y_1)$

$$d = \frac{ax_1 + by_1 + c}{\sqrt{\quad}}$$

$\sqrt{a^2+b^2}$

$4x + 2y - 3 = 0$

$a \quad b$

$y = mx + 1$

$y - mx - c = 0$

L.H.S = R.H.S

$P = (5, 10)$

$$\frac{4 \times 5 + 2 \times 10 - 3}{\sqrt{4^2 + 2^2}}$$

$$\frac{20 + 20 - 3}{\sqrt{16 + 4}}$$

$$\frac{37}{\sqrt{20}}$$

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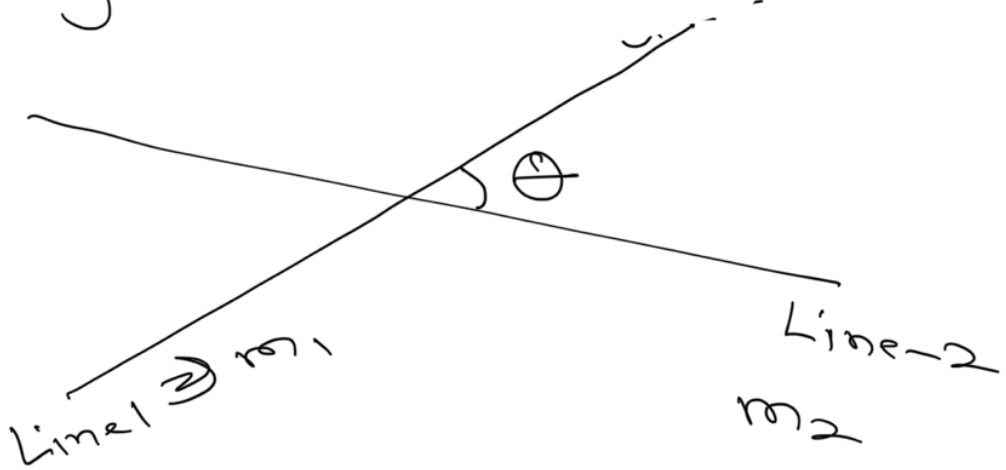
(11) Angle between two lines



② $\tan\theta = \dfrac{m_2 - m_1}{1 + m_2 \times m_1}$

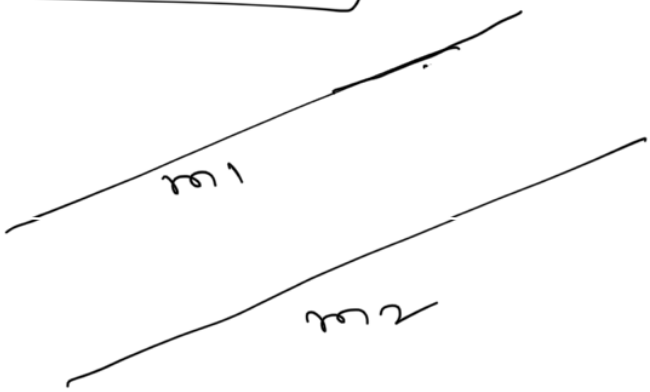
$\theta = 0$

$\tan 0 = 0$

$0 = \dfrac{m_2 - m_1}{1 + m_2 \times m_1}$

$m_2 - m_1 = 0$

$\boxed{m_2 = m_1}$



$\theta = 90^\circ$

$\tan(90) =$

$\infty = \dfrac{m_2 - m_1}{1 + m_2 \cdot m}$

$\dfrac{1}{0} = \dfrac{1 + m_2 \cdot m}{m_2 - m}$

$0 = \dfrac{1 + m_2 \cdot m_1}{m_2 - m_1}$

$1 + m_2 \cdot m_1 = 0$

$m_2 \cdot m_1 = \boxed{-1}$

$\frac{1}{\infty}$ → Not defined

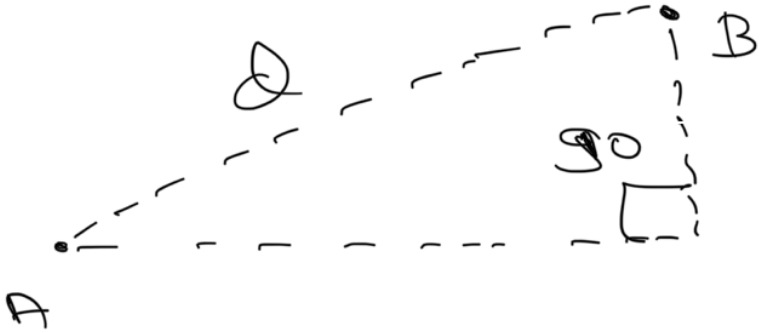
→ 0

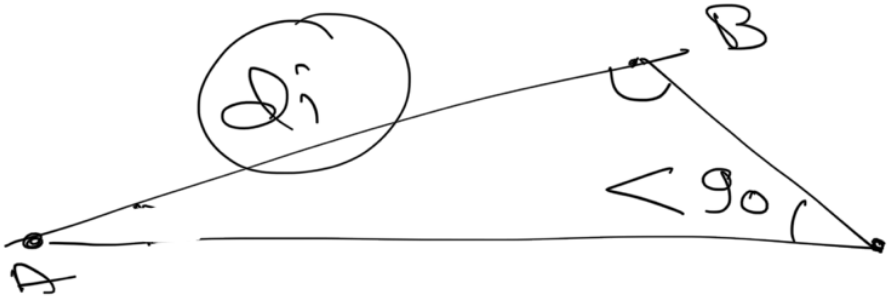
$\frac{1}{1000}$ → 0.001 → 0

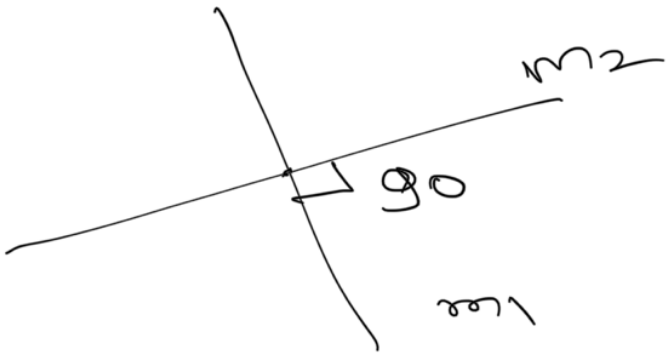
$\frac{1}{10000000}$ → 0.0000001 → 0

$\frac{1}{\infty}$ = 0

Doubts







$m_2 \times m_1 = -1$

	x_1	x	y
	P.S.P	Attendance	Marks
Gautam →	2	30	90
Sagar →	3	40	85
Dabir →	1	35	85

Goal is to build a ML model which predicts how much marks a student would scor

$$a \times PSP + b \times att + c = marks$$

$$a x_1 + b x_2 + c = y$$

$$2x_1 + 3x_2 + 10 = y$$

model

92 → 90

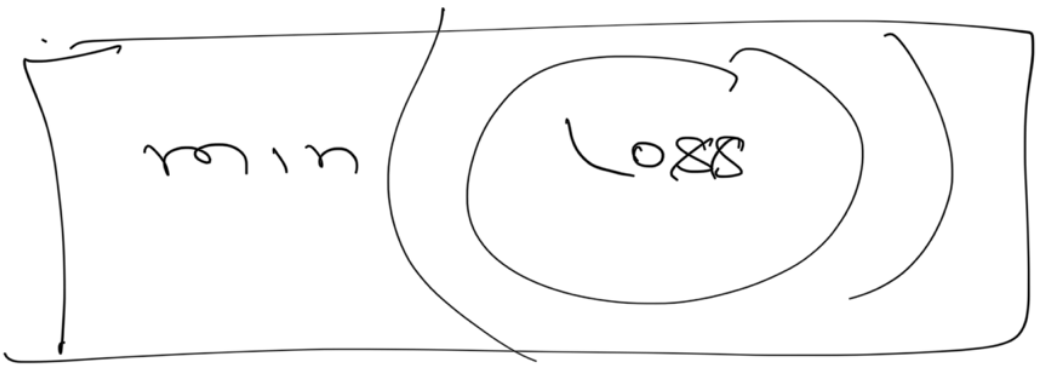
80 → 85

87 → 85

Error

Loss → $(92-90)^2 + (85-80) + (85-87)^2$

Calculate Loss/Error



to minimise → $\text{Slop}\left(\frac{\text{Loss}}{a}\right)$

$a \Rightarrow a - \left(\frac{\Delta L}{a}\right) \text{Slop}\left(\frac{\text{Loss}}{b}\right)$

$\text{Slop}\left(\frac{\text{Loss}}{c}\right)$

- Linear Regress
- Logistic Regress

→ Distance + gradien

- KNN
- K-means

} L1 L2

5x3 + 5x3 → 30 sec

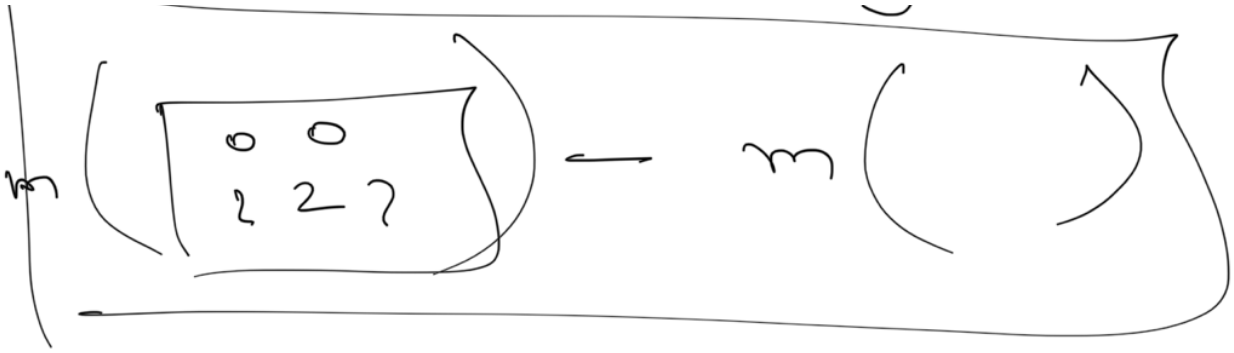
dip

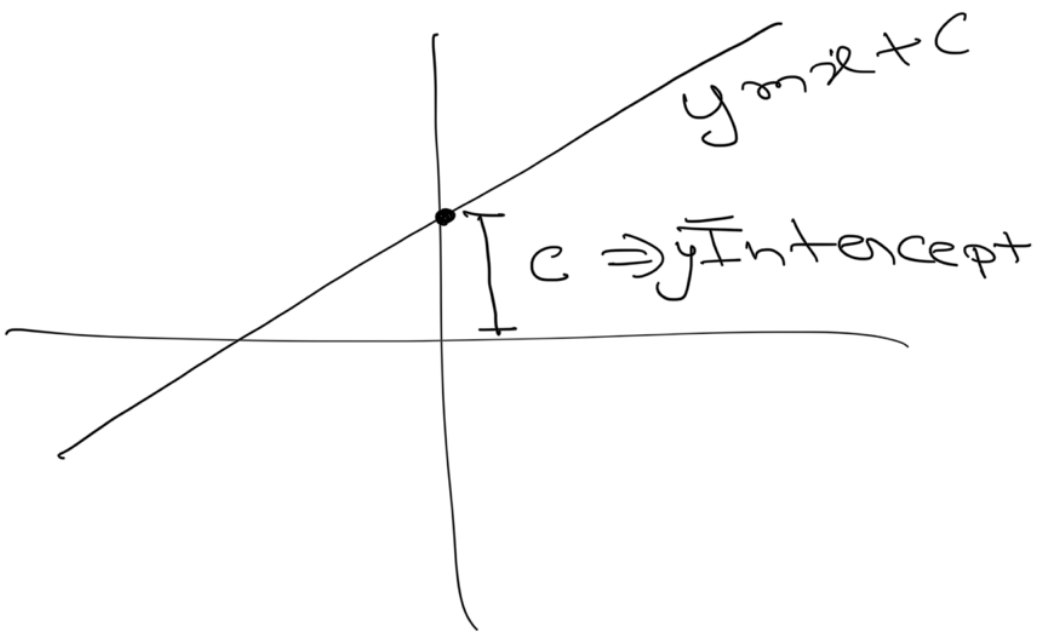
For 1 pair of products

m.s =: Easy

Euclidean Distance

Hamming


0 0
2 2 7


y = mx + c
c ⇒ y Intercept