

# Linear Algebra:-

$$y = 2x + 5$$

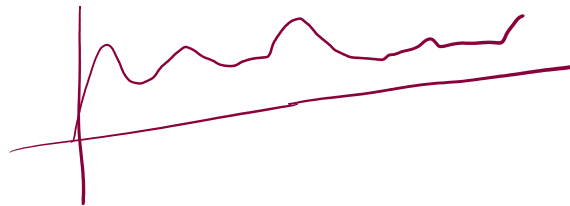
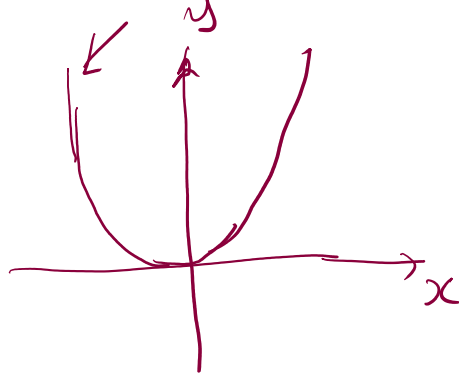
$$y = mx + c$$

$$x + 2y - 2 = 0$$

$$y = x^2$$

Linear

Non Linear



$$\begin{bmatrix} 1 & 3 \\ 3 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 18 \end{bmatrix}$$

$$\rightarrow |A| = (9 - 9) = 0$$

$$x + 3y = 6$$

$$3x + 9y = 18 \Rightarrow \underline{x + 3y = 6}$$

$$x + 3y = 0$$

$$x = 5$$

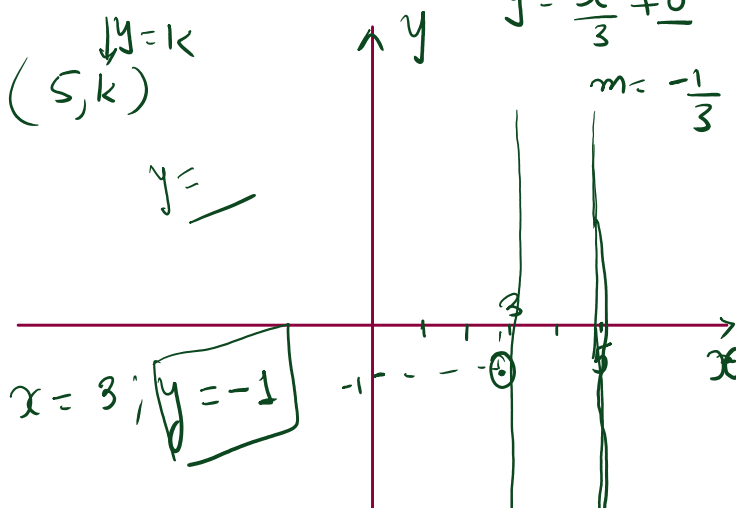
$$y = k$$

$$(5, k)$$

$$y = \underline{\hspace{2cm}}$$

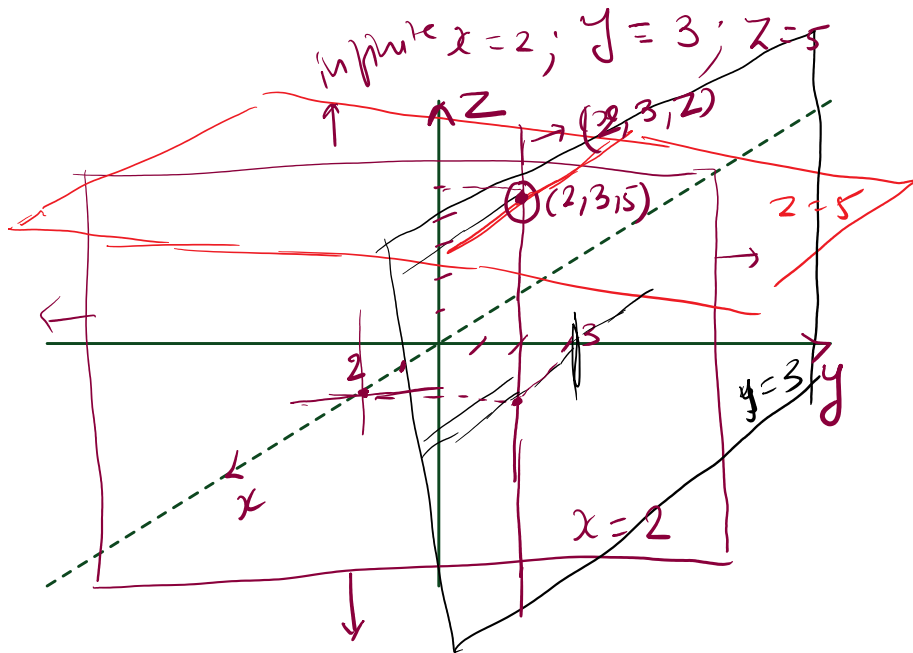
$$y = -\frac{x}{3} + \underline{0} \quad (c=0)$$

$$m = -\frac{1}{3}$$



$$x=3 \mid x=5$$

$$x, y, z ; x=2, y, z$$



• Row Picture :-

\* Column Picture :-

$$x - 2y = 1$$

$$-2x + y = -5$$

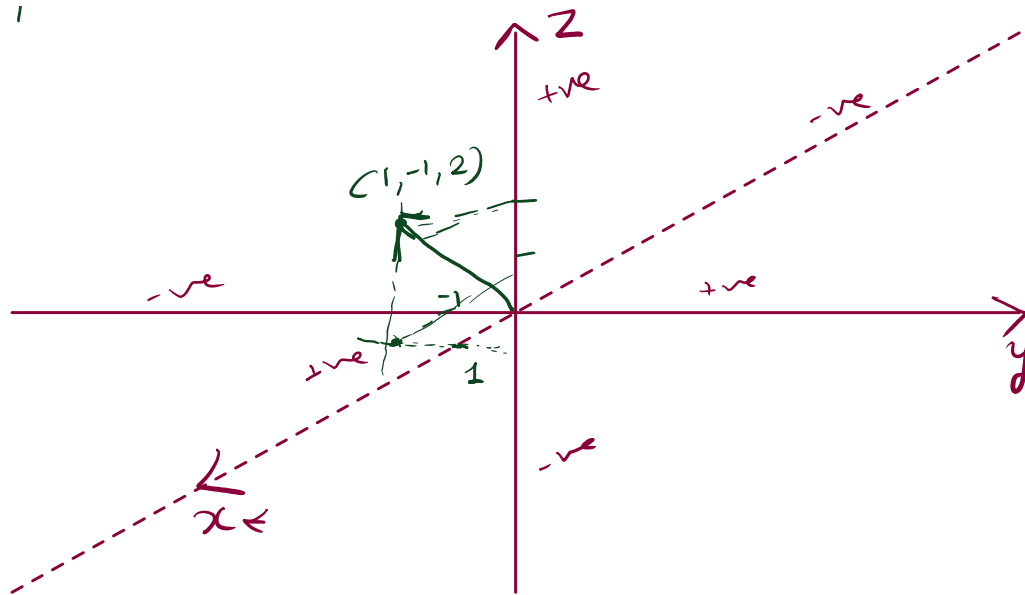
$\Rightarrow$  Row Picture  $\Rightarrow$   
(form)

$$\begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ -5 \end{bmatrix}$$

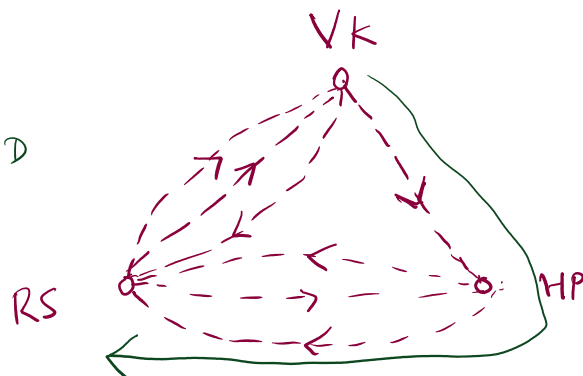
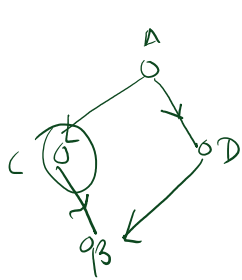
Column form :-

$$-3 + (-2) = 1$$





\* Tracing a path:-



Receiver  
↓

VK

RS

HP

→ Sender  
VK

RS

HP

0	2	0
1	0	2
1	1	0

$$= 2+2+1+1+1$$

$$= 7$$

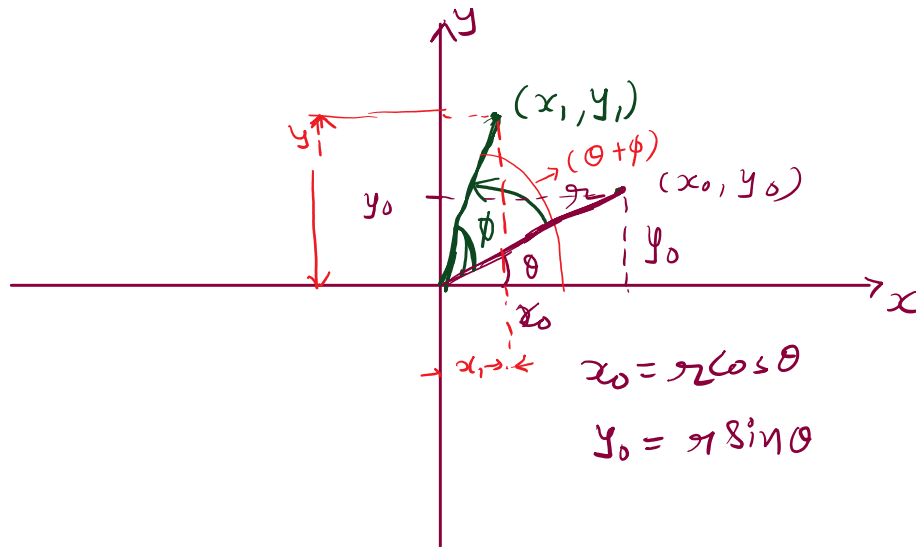
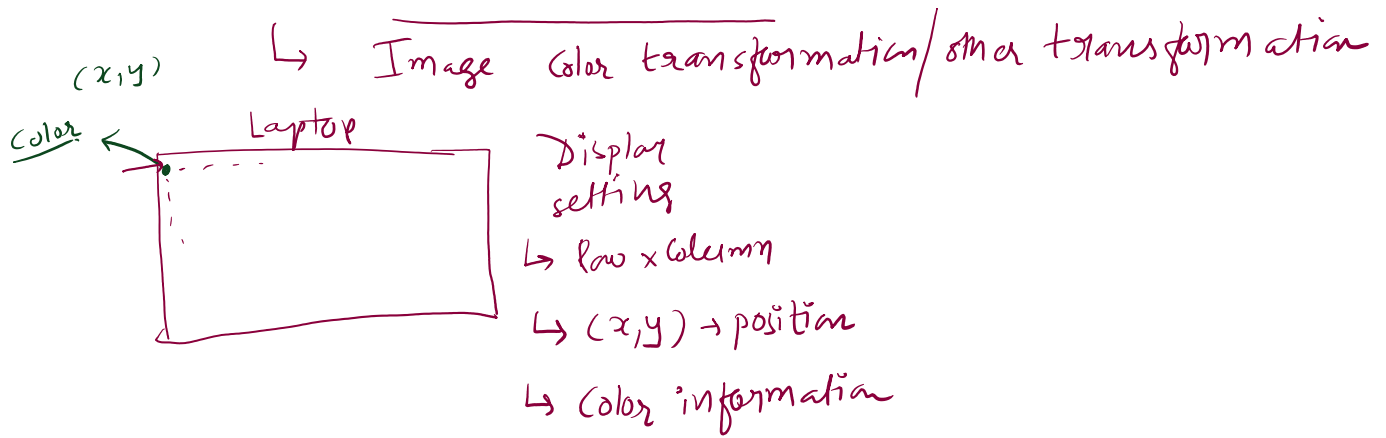
Topology



Tree

\* Image Processing:-

↳ Image orientation ✓



$$x_1 = r \cos(\theta + \phi)$$

$$= r [\cos \theta \cdot \cos \phi - \sin \theta \cdot \sin \phi]$$

$$= \underline{r \cos \theta} \cdot \cos \phi - \underline{r \sin \theta} \cdot \sin \phi$$

$$x_1 = x_0 \cos \phi - y_0 \sin \phi \quad \dots (1)$$

$$y_1 = r \sin(\theta + \phi)$$

$$= r [\sin \theta \cos \phi + \cos \theta \sin \phi]$$

$$= r \sin \theta \cos \phi + r \cos \theta \sin \phi$$

$$= y_0 \cdot \cos \phi + x_0 \sin \phi$$

$$= x_0 \sin \phi + y_0 \cos \phi \quad \text{--- (2)}$$

$$x_0 \cos \phi - y_0 \sin \phi = x_1$$

$$x_0 \sin \phi + y_0 \cos \phi = y_1$$

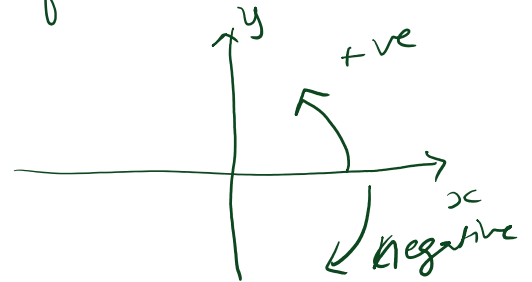
$$\checkmark \begin{bmatrix} \cos \phi & -\sin \phi \\ \sin \phi & \cos \phi \end{bmatrix} \begin{bmatrix} x_0 \\ y_0 \end{bmatrix} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} \quad \text{--- (3)}$$

\* Take a point (2,1) and rotate it counter clockwise by  $90^\circ$ . (with the help of matrix) and find the coordinates of the new point.

$$\phi = 90^\circ$$

$$x_0 = 2$$

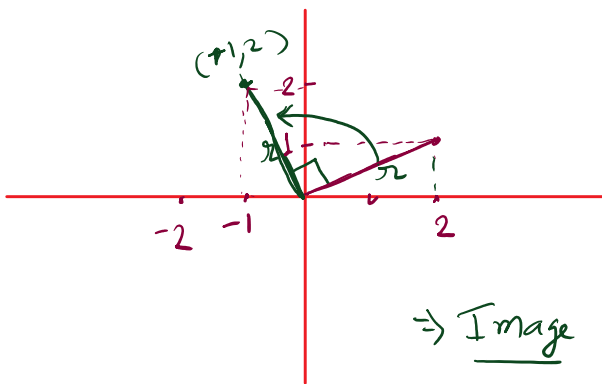
$$y_0 = 1$$



$$\begin{bmatrix} \cos 90^\circ & -\sin 90^\circ \\ \sin 90^\circ & \cos 90^\circ \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0 \times 2 + (-1) \times 1 \\ (1 \times 2) + (0 \times 1) \end{bmatrix}$$

$$= \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

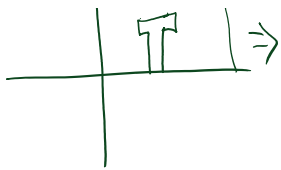


$\Rightarrow$  Image Rotation:-

$$\begin{bmatrix} \cos \phi & -\sin \phi \\ \sin \phi & \cos \phi \end{bmatrix} \begin{bmatrix} x_0 & x_1 & x_2 & \dots & x_{999} \\ y_0 & y_1 & y_2 & \dots & y_{999} \end{bmatrix}$$



$$= \begin{bmatrix} u_0 & u_1 & u_2 & \dots & u_{999} \\ v_0 & v_1 & v_2 & \dots & v_{999} \end{bmatrix}$$



⇒ RGB

$$= [v_0 \ v_1 \ v_2 \ \dots \ v_{499}]$$



$$\frac{2^8 \times 2^8 \times 2^8}{256 \times 256 \times 256} = \frac{2^4}{2}$$

24 bit

⇒  $2^{24}$  total

[000000H] → IP

[000001H]

[000002H] ...

⊙ → [x, y]

↳ [R G B]

0 → 255

## \* Encoding - Decoding of Information:-

space	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Z
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	26

✓ "AC IN CAR" ⇒ "1 3 0 9 14 0 3 1 18"

"AC NO IS \_\_\_\_\_"

$$\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 & 14 & 3 & 18 \\ 3 & 9 & 0 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 8 \end{bmatrix}$$

$$= \begin{bmatrix} (1 \times 1) + (3 \times 3) \\ = 10 \end{bmatrix} \quad 27 \dots$$

↓ Tx Mater



