

# Assignment 2

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Download all python codes from

[https://github.com/kavyakamal66/IITH-INTERNSHIP/blob/main/Assignment\\_2/code\\_2.py](https://github.com/kavyakamal66/IITH-INTERNSHIP/blob/main/Assignment_2/code_2.py)

and latex-tikz codes from

[https://github.com/kavyakamal66/IITH-INTERNSHIP/blob/main/Assignment\\_2/latex\\_2.tex](https://github.com/kavyakamal66/IITH-INTERNSHIP/blob/main/Assignment_2/latex_2.tex)

Equation of the line is,

$$\mathbf{n}^T \mathbf{x} = 0 \quad (2.0.5)$$

$$(-\sin \theta - m \cos \theta \quad \cos \theta - m \sin \theta) \mathbf{x} = 0 \quad (2.0.6)$$

To plot the line,

Assuming  $m = 1$ ,  $c = 6$  and  $\theta = \pi/2$

ie,

$$\mathbf{n} = \begin{pmatrix} -\sin \pi/2 - \cos \pi/2 \\ \cos \pi/2 - \sin \pi/2 \end{pmatrix} \quad (2.0.7)$$

$$\mathbf{n} = \begin{pmatrix} -1 \\ -1 \end{pmatrix} \quad (2.0.8)$$

Therefore, Equation of the line is  $(-1 \quad -1)x = 0$

## 1 QUESTION NO. 2.110

Find the equation of the line passing through the origin and making an angle  $\theta$  with the line  $(-m \ 1)x = c$

## 2 SOLUTION

Given, Equation of the line,

$$L_1 = (-m \ 1)x = c \quad (2.0.1)$$

Line 'L' makes angle  $\theta$  with  $L_1$

We get the normal vector ,n of L when we multiply the rotation matrix with normal vector of  $L_1$

$$\mathbf{n} = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} -m & 1 \end{pmatrix} = \begin{pmatrix} -m \cos \theta - \sin \theta \\ -m \sin \theta + \cos \theta \end{pmatrix} \quad (2.0.2)$$

Equation of a line is,

$$\mathbf{n}^T (\mathbf{x} - \mathbf{A}) = 0 \quad (2.0.3)$$

Since L passes through the origin,

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (2.0.4)$$

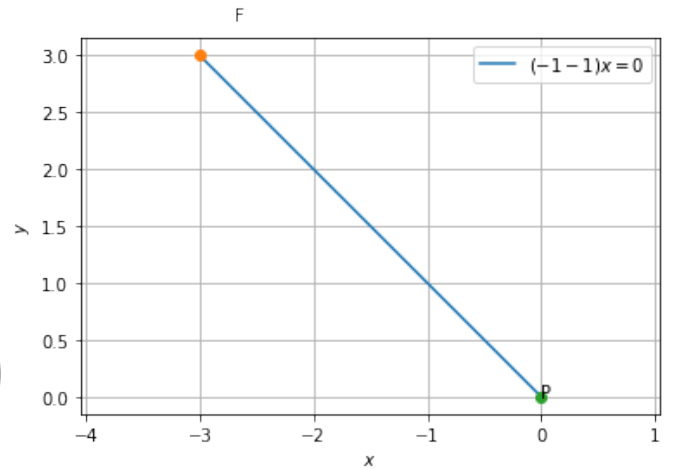


Fig. 0: The Constructed triangle