Assignment 2

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Download all python codes from

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

1 Question No. 2.110

Find the equation of the line passing through the origin and making and angle θ with the the line $\begin{pmatrix}-m & 1\end{pmatrix} x = c$

2 Solution

Given, Equation of the line,

$$L_1 = \begin{pmatrix}-m & 1\end{pmatrix} x = c \tag{2.0.1}$$

Line 'L' makes angle θ with L_1

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

$$\begin{pmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{pmatrix}\begin{pmatrix}-m & 1\end{pmatrix} = \begin{pmatrix}-m\cos\theta - \sin\theta \\ -m\sin\theta + \cos\theta\end{pmatrix} \tag{2.0.2}$$

Equation of a line is,

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

Since L passes through the origin, $A = \begin{pmatrix}0\\0\end{pmatrix}$

ie ,Equation of the line is,

$$\mathbf{n^T x = 0} \tag{2.0.4}$$

$$\begin{pmatrix}-\sin\theta - m\cos\theta & \cos\theta - m\sin\theta\end{pmatrix} x = 0 \tag{2.0.5}$$

To plot the line,

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

ie,

$$n^T = \begin{pmatrix}-\sin\pi/2 - \cos\pi/2 & \cos\pi/2 - \sin\pi/2\end{pmatrix} \tag{2.0.6}$$

$$n^T = \begin{pmatrix}-1 & -1\end{pmatrix} \tag{2.0.7}$$

Therefore, Equation of the line is $\begin{pmatrix}-1 & -1\end{pmatrix} x = 0$

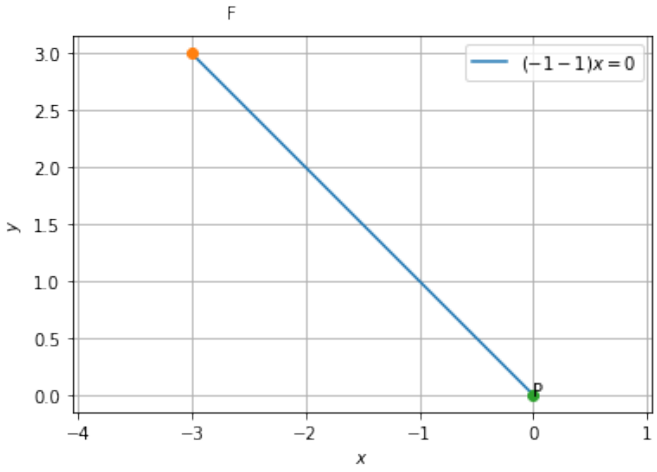

Fig. 0: The Constructed triangle