# 2.10.50

EE25BTECH11021 - Dhanush Sagar

**Question**

Find the equation of the line passing through (1, 2) and making angle 30°with y-axis.

**Solution:**

Given point,

$$\mathbf{A} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \tag{0.1}$$

and the line makes an angle of 30° with the y-axis.

The slope of the line is reciprocal of $\tan 30°$:

$$m = \frac{1}{\tan 30°} \tag{0.2}$$

Evaluating, we get:

$$m = \sqrt{3} \tag{0.3}$$

The direction vector of the line is $\begin{pmatrix} 1 \\ m \end{pmatrix}$, hence the normal vector is:

$$\mathbf{n} = \begin{pmatrix} \sqrt{3} \\ -1 \end{pmatrix} \tag{0.4}$$

Equation of the line is given by :

$$\mathbf{n}^\top \mathbf{x} = \mathbf{n}^\top \mathbf{A} \tag{0.5}$$

Substituting the values of $\mathbf{n}$ and $\mathbf{A}$:

$$\begin{pmatrix} \sqrt{3} & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} \sqrt{3} & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} \tag{0.6}$$

Evaluating the RHS gives:

$$\begin{pmatrix} \sqrt{3} & -1 \end{pmatrix} \mathbf{x} = \sqrt{3} - 2 \tag{0.7}$$

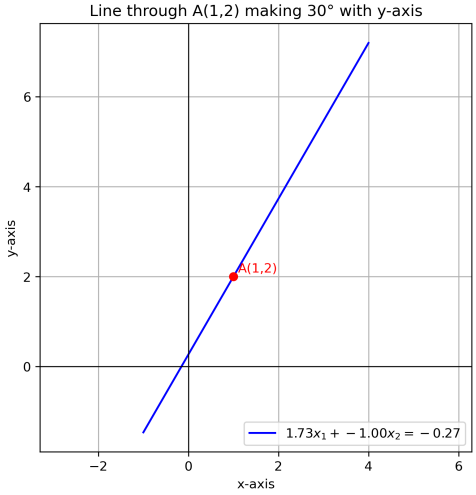
Line through A(1,2) making 30° with y-axis
y-axis
x-axis
A(1,2)
$1.73x_1 + -1.00x_2 = -0.27$
6
4
2
0
−2
0
2
4
6

Fig. 0.1