1-1.10-21

AI24BTECH11015 - Harshvardhan Patidar

Question:
Write down a unit vector in XY-plane, making an angle of 30° with the positive direction of X axis.

Solution:

Variable	Description
$\mathbf{m}$	Unit Vector
α	Angle of the unit vector with x-axis
β	Angle of the unit vector with y-axis

TABLE 0: Variables Used

We have, in the 2-D space, the unit direction vector is given by

$$\mathbf{m} = \begin{pmatrix} \cos\alpha \\ \cos\beta \end{pmatrix} \tag{0.1}$$

Given,

$$\alpha = 30^\circ \tag{0.2}$$

So,

$$\beta = 90^\circ - \alpha \tag{0.3}$$

$$\beta = 60^\circ \tag{0.4}$$

Putting values in (0.1), we get

$$\mathbf{m} = \begin{pmatrix} \cos 30^\circ \\ \cos 60^\circ \end{pmatrix} \tag{0.5}$$

$$\mathbf{m} = \begin{pmatrix} \frac{\sqrt{3}}{2} \\ \frac{1}{2} \end{pmatrix} \tag{0.6}$$

So,

$$\mathbf{m} = \frac{1}{2}\begin{pmatrix} \sqrt{3} \\ 1 \end{pmatrix} \tag{0.7}$$

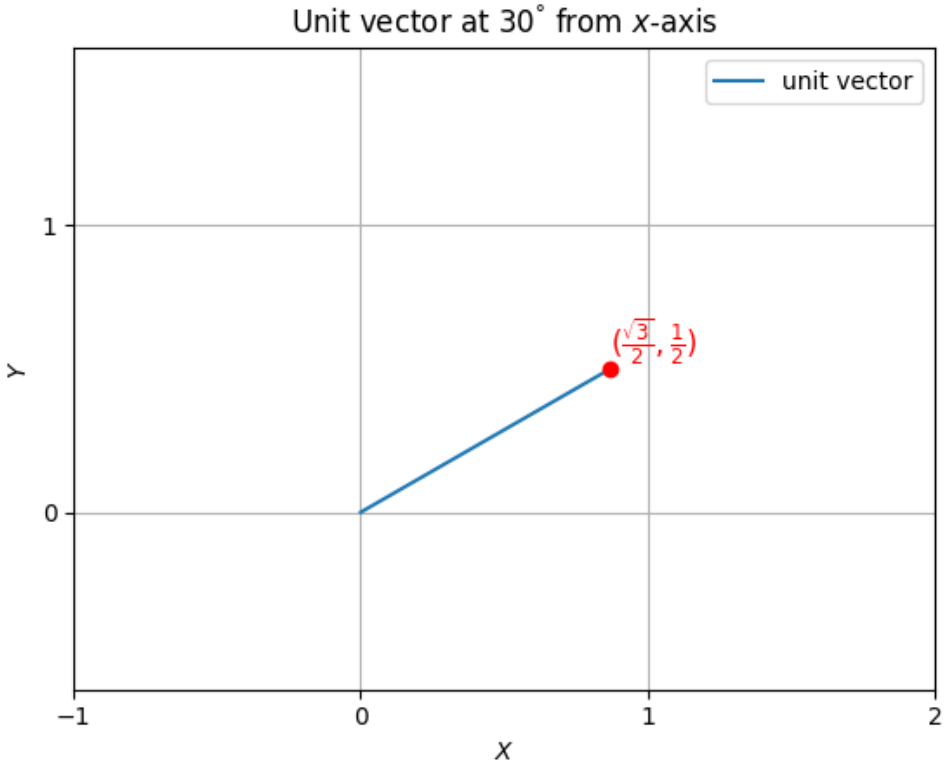

Fig. 0.1: Unit Vector