1-1.2-21

EE24BTECH11062 - Vuddanti Homa Harshitha

Question:
Represent graphically a displacement of $40km, 30°$ west of south.
Solution:

Variable	Description
R	Magnitude of the displacement
θ	Angle relative to East, taken anticlockwise
x	Horizontal component of displacement
y	Vertical component of displacement

1-1.2-21-Table-1 : Variables Used

The position vector can be represented as :

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} R\cos\theta \\ R\sin\theta \end{pmatrix} \tag{0.1}$$

Given,

$$R = 40km \tag{0.2}$$

$$\theta = 240° = \frac{4\pi}{3} \tag{0.3}$$

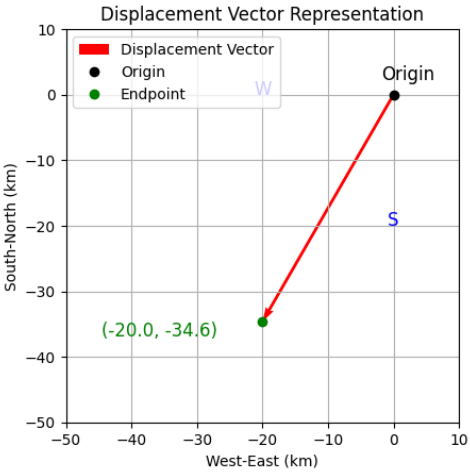
From equations (**??**) and (**??**), the horizontal and vertical components are:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40\cos\left(\frac{4\pi}{3}\right) \\ 40\sin\left(\frac{4\pi}{3}\right) \end{pmatrix} \tag{0.4}$$

$$\implies \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -\frac{40}{2} \\ -\frac{40\sqrt{3}}{2} \end{pmatrix} \tag{0.5}$$

$$\implies \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -20 \\ -20\sqrt{3} \end{pmatrix} \tag{0.6}$$

This can be represented graphically as below:



1-1.2-21-Figure-1: Graphical representation of the displacement vector