

Question 1.8.16

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Question:

Find a vector in the direction of vector $\mathbf{a} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ that has magnitude 7 units.

Solution:

To find a vector in the direction of a vector \mathbf{q} with a magnitude of m , we first have to find a unit vector in the direction of \mathbf{q} , called $\hat{\mathbf{q}}$.

$$\hat{\mathbf{q}} = \frac{\mathbf{q}}{\|\mathbf{q}\|} \quad (1)$$

A vector in the direction of \mathbf{q} ($\hat{\mathbf{q}}$) having a magnitude of m is then $m\hat{\mathbf{q}} = m \frac{\mathbf{q}}{\|\mathbf{q}\|}$

$$\therefore \text{Required vector} = 7 \frac{\begin{pmatrix} 1 \\ -2 \end{pmatrix}}{\left\| \begin{pmatrix} 1 \\ -2 \end{pmatrix} \right\|} \quad (2)$$

$$= \begin{pmatrix} \frac{7}{\sqrt{5}} \\ -\frac{14}{\sqrt{5}} \end{pmatrix} \quad (3)$$

Figure:

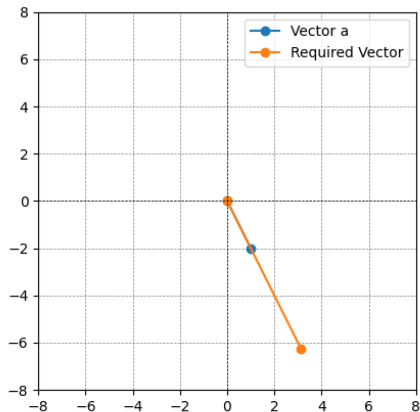


Figure: Plot showing the original vector **a** and the required vector in its direction with a magnitude of 7 units.