

Question 1.8.16

AI25BTECH11040 - Vivaan Parashar

September 12, 2025

Question:

Find a vector in the direction of vector $\mathbf{a} = \hat{\mathbf{i}} - 2\hat{\mathbf{j}}$ 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} ($\hat{\mathbf{q}}$) is then $m\hat{\mathbf{q}} = m\frac{\mathbf{q}}{|\mathbf{q}|}$

$$\therefore \text{Required vector} = 7 \frac{\hat{\mathbf{i}} - 2\hat{\mathbf{j}}}{|\hat{\mathbf{i}} - 2\hat{\mathbf{j}}|} \quad (2)$$

$$= \frac{7}{\sqrt{5}}\hat{\mathbf{i}} - \frac{14}{\sqrt{5}}\hat{\mathbf{j}} \quad (3)$$