Question 1.4.15

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

$$\hat{\mathbf{q}} = \frac{\mathbf{q}}{|\mathbf{q}|} \tag{1}$$

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

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

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