

## Question 1.8.16

AI25BTECH11040 - Vivaan Parashar

September 16, 2025

### 1 Question:

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

### 2 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  $m\hat{\mathbf{q}} = m\frac{\mathbf{q}}{\|\mathbf{q}\|}$

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

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