Component and unit-vector notation

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Write $(5, -7)$ in basis-vector notation. [2 marks]

The first component multiplies i and the second multiplies j.

Answer: $5\mathbf{i} - 7\mathbf{j}$.

2. Write $6\mathbf{j} + 2\mathbf{i}$ as an ordered pair. [2 marks]

Read coefficients in x-then-y order.

Answer: $(2, 6)$.

3. Find a unit vector in the direction of $(8, 6)$. [2 marks]

The magnitude is 10.

Divide both components by 10.

Answer: $(\frac{4}{5}, \frac{3}{5})$.

4. Find both unit vectors parallel to $(1, -1)$. [3 marks]

The vector has magnitude $\sqrt{2}$.

Normalise and then take its opposite.

Answer: $\pm(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$.

5. Find k if $(\frac{3}{5}, k)$ is a unit vector. [3 marks]

$\frac{9}{25} + k^2 = 1$ gives $k^2 = \frac{16}{25}$.

Both vertical signs give length one.

Answer: $k = \frac{4}{5}$ or $k = -\frac{4}{5}$.

6. Explain why normalising the zero vector is impossible. [2 marks]

The magnitude of the zero vector is zero, so the normalisation formula is undefined.

Answer: It would require division by zero and there is no unique direction.