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: $(4/5, 3/5)$.

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

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

Normalise and then take its opposite.

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

5. Find k if $(3/5, k)$ is a unit vector. [3 marks]

$9/25 + k^2 = 1$ gives $k^2 = 16/25$.

Both vertical signs give length one.

Answer: $k = 4/5$ or $k = -4/5$.

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.