Three-dimensional coordinates, magnitude and unit vectors

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Find the magnitude of $(1, 2, 2)$. [2 marks]

Add squares: $1 + 4 + 4 = 9$.

Take the positive square root.

Answer: 3

2. Find a unit vector along $(0, -3, 4)$. [2 marks]

The length is 5.

Divide every component by 5.

Answer: $(0, -\frac{3}{5}, \frac{4}{5})$

3. Find the distance from $(2, -1, 3)$ to $(5, 3, 15)$. [2 marks]

The displacement is $(3, 4, 12)$.

Its squared length is $9 + 16 + 144 = 169$.

Answer: 13

4. Find a length-6 vector opposite to $(1, 2, 2)$. [2 marks]

The original length is 3.

Multiply by -2 to reverse direction and double length.

Answer: $(-2, -4, -4)$

5. Find positive k when $|(k, 2, 2)| = 5$. [2 marks]

$k^2 + 8 = 25$.

Hence $k^2 = 17$; use the positive condition.

Answer: $k = \sqrt{17}$

6. A drone moves 6 m east, 3 m north and 2 m up. Find its displacement length. [2 marks]

The directions are perpendicular.

$\sqrt{36 + 9 + 4} = 7$.

Answer: 7 m