Addition/subtraction and scalar multiplication

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. For $\mathbf{a} = (4, -2)$ and $\mathbf{b} = (-1, 5)$, find $\mathbf{a} + \mathbf{b}$. [2 marks]

Add corresponding components.

Answer: $(3, 3)$.

2. For the same vectors, find $\mathbf{a} - \mathbf{b}$. [2 marks]

$4 - (-1) = 5$ and $-2 - 5 = -7$.

Answer: $(5, -7)$.

3. Find $-3(2, -4) + 2(-1, 1)$. [2 marks]

The scaled vectors are $(-6, 12)$ and $(-2, 2)$.

Add them.

Answer: $(-8, 14)$.

4. Solve $2\mathbf{x} + (1, -3) = (7, 5)$. [2 marks]

$2\mathbf{x} = (6, 8)$.

Divide both components by 2.

Answer: $\mathbf{x} = (3, 4)$.

5. A drone flies $(3, 2)$ km, then $(-5, 1)$ km, then $(1, -4)$ km. Find its displacement and direct return vector. [3 marks]

Add all three legs componentwise.

Negate the resultant for the return.

Answer: Displacement $(-1, -1)$ km; return $(1, 1)$ km.

6. If $|\mathbf{u}| = 7$, find $|-\frac{3}{2}\mathbf{u}|$ and explain the direction. [3 marks]

Multiply the length by $\frac{3}{2}$.

The negative scalar reverses direction.

Answer: 10.5; opposite to $\mathbf{u}$.