Dot product

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Calculate $(5, 2) \cdot (-1, 4)$. [2 marks]

$5(-1) + 2(4) = 3$.

Answer: 3.

2. Calculate $(3, -4) \cdot (3, -4)$ and interpret it. [2 marks]

$9 + 16 = 25$; the magnitude is 5.

Answer: 25, the squared magnitude.

3. Classify the angle between $(1, 2)$ and $(-3, 1)$. [2 marks]

The dot product is $-3 + 2 = -1 < 0$.

Answer: Obtuse.

4. Find k if $(k, 2) \cdot (3, -1) = 10$. [2 marks]

$3k - 2 = 10$, so $3k = 12$.

Answer: $k = 4$.

5. If $\mathbf{a} \cdot \mathbf{b} = 7$ and $\mathbf{a} \cdot \mathbf{c} = -2$, find $\mathbf{a} \cdot (2\mathbf{b} - 3\mathbf{c})$. [2 marks]

Distribute: $2(7) - 3(-2) = 20$.

Answer: 20.

6. Given $|\mathbf{a}| = 5$, $|\mathbf{b}| = 2$ and $\mathbf{a} \cdot \mathbf{b} = -3$, find $|\mathbf{a} + \mathbf{b}|$. [3 marks]

Square the length using the dot product: $25 + 4 + 2(-3) = 23$.

Take the non-negative square root.

Answer: $\sqrt{23}$.