Example 1

Find the angle between two vectors $\vec{a}$ = (1; 3) and $\vec{b}$= (2; 1).

Find $(\vec{a}, \vec{b})$ = ?

Example 2

Find the angle between two vectors $\vec{a}$ = (4; 6) and $\vec{b}$= (6; -4).

Find $(\vec{a}, \vec{b})$ = ?

Example 3

Find the angle between two vectors $\vec{a}$ = (4; 0) and $\vec{b}$= (2; -2).

Find $(\vec{a}, \vec{b})$ = ?

Example 4

Find the angle between two vectors $\vec{a}$ = (2; -2; 0) and $\vec{b}$= (4; 0; -4).

Find $(\vec{a}, \vec{b})$ = ?

Example 5

Find the angle between two vectors $\vec{a}$ = (-3; -3; 0) and $\vec{b}$= ($\sqrt{2}$; $\sqrt{2}$; 2).

Find $(\vec{a}, \vec{b})$ = ?

Answer 1

Calculate dot product of vectors: $\vec{a} \cdot \vec{b}$ = 1 · 2 + 3 · 1 = 5

Calculate vectors magnitude:

$|\vec{a}| = \sqrt{1^2 + 3^2} = \sqrt{10}$

$|\vec{b}| = \sqrt{2^2 + 1^2} = \sqrt{5}$

Calculate the angle between vectors $\cos(\vec{a}, \vec{b}) = \frac{5}{\sqrt{10} \cdot \sqrt{5}} = \frac{\sqrt{2}}{2}$

$\cos(\vec{a}, \vec{b}) = \arccos\frac{\sqrt{2}}{2} = \frac{\pi}{4}$

Answer 2

Calculate dot product of vectors: $\vec{a} \cdot \vec{b}$ = 4 · 6 + (-4) · 6 = 0

Calculate vectors magnitude:

$|\vec{a}| = \sqrt{4^2 + 6^2} = \sqrt{52}$

$|\vec{b}| = \sqrt{6^2 + (-4)^2} = \sqrt{52}$

Calculate the angle between vectors $\cos(\vec{a}, \vec{b}) = \frac{0}{\sqrt{52} \cdot \sqrt{52}} = 0$

$\cos(\vec{a}, \vec{b}) = 90^\circ$

Answer 3

Calculate dot product of vectors: $\vec{a} \cdot \vec{b}$ = 4 · 2 + (-2) · 0 = 8

Calculate vectors magnitude:

$|\vec{a}| = \sqrt{4^2 + 0} = \sqrt{16} = 4$

$|\vec{b}| = \sqrt{2^2 + (-2)^2} = 2\sqrt{2}$

Calculate the angle between vectors $\cos(\vec{a}, \vec{b}) = \frac{0}{4 \cdot 2\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\cos(\vec{a}, \vec{b}) = \frac{\pi}{4}$

Answer 4

Calculate dot product of vectors: $\vec{a} \cdot \vec{b}$ = 4 · 2 - 2 · 0 - 4 · 0 = 8

Calculate vectors magnitude:

$|\vec{a}| = \sqrt{4 + 4}$

$|\vec{b}|$ = $\sqrt{16+16}$

Calculate the angle between vectors $\cos(\vec{a},\vec{b}) = \frac{8}{\sqrt{4+4}\cdot\sqrt{16+16}} = \frac{1}{2}$

$\cos(\vec{a},\vec{b}) = 60^\circ$

Answer 5

Calculate dot product of vectors: $\vec{a}\cdot\vec{b}$ = $-6\sqrt{2}$

Calculate vectors magnitude:

$|\vec{a}|$ = $\sqrt{9+9}$

$|\vec{b}|$ = $\sqrt{2+2+4}$

Calculate the angle between vectors $\cos(\vec{a},\vec{b}) = \frac{-6\sqrt{2}}{\sqrt{9+9}\cdot\sqrt{2+2+4}} = -\frac{\sqrt{2}}{2}$

$\cos(\vec{a},\vec{b}) = 180^\circ - 45^\circ = 135^\circ$