

Mechanics I – Quiz 3 – Group B

2019-2020

Nov 14, 2019

KEY

Full Name:

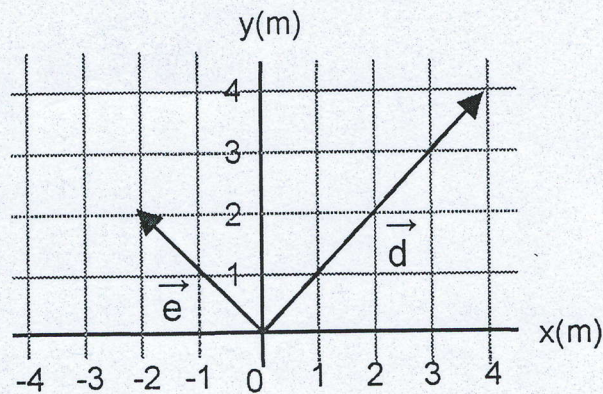
(The quiz is over 4 marks. 2+2)

1. Look at the graph and answer the questions.

- A) Write the vector components of $\vec{d}$ and $\vec{e}$ in terms of unit vectors.
B) Calculate the angle between the vectors $\vec{d}$ and $\vec{e}$.

2. Calculate vector $\vec{f}$.

$$\vec{f} = \vec{d} \times \vec{e}$$



Answers

1) a) $\vec{d} = 4\hat{i} + 4\hat{j}$
 $\vec{e} = -2\hat{i} + 2\hat{j}$

b) $\vec{d} \cdot \vec{e} = |\vec{d}| |\vec{e}| \cos \theta$
 $\cos \theta = \frac{\vec{d} \cdot \vec{e}}{|\vec{d}| |\vec{e}|}$
 $\vec{d} \cdot \vec{e} = (4\hat{i} + 4\hat{j}) \cdot (-2\hat{i} + 2\hat{j})$
 $= (-8) + (8) = 0$
 $|\vec{d}| = \sqrt{4^2 + 4^2} = 4\sqrt{2}$
 $|\vec{e}| = \sqrt{(-2)^2 + 2^2} = 2\sqrt{2}$

$\cos \theta = \frac{0}{4\sqrt{2} \cdot 2\sqrt{2}} = \frac{0}{16} = 0$
 $\theta = \cos^{-1} 0 = 90^\circ$

2.

$$\vec{f} = \vec{d} \times \vec{e}$$

$$= (4\hat{i} + 4\hat{j}) \times (-2\hat{i} + 2\hat{j})$$

$$= 8\hat{k} - (-8\hat{k})$$

$$= 16\hat{k}$$



$$\vec{d} = -2\hat{i} + 2\hat{j}$$

$$\vec{e} = 4\hat{i} + 4\hat{j}$$

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

$$|\vec{e}| = \sqrt{4^2 + 4^2} = 4\sqrt{2}$$

$$\vec{d} \cdot \vec{e} = (-2)(4) + (2)(4) = 0$$

$$\cos \theta = \frac{\vec{d} \cdot \vec{e}}{|\vec{d}| |\vec{e}|} = \frac{0}{2\sqrt{2} \cdot 4\sqrt{2}} = 0$$

$$\theta = \cos^{-1}(0) = 90^\circ$$