Mechanics I – Quiz 3 - Group A

2019-2020   Nov 14, 2019

KEY

Full Name:..
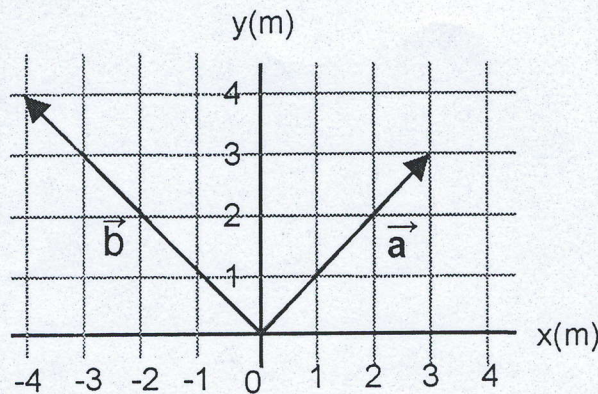
(The quiz is over 4 marks. 2+2)

1. Look at the graph and answer the questions.

    A) Write the vector components of $\vec{a}$ and $\vec{b}$ in terms of unit vectors.
    B) Calculate the angle between the vectors **a** and **b**.

2. Calculate vector **c**.

$$\vec{c} = \vec{a} \times \vec{b}$$

Answers

a) $\vec{a} = 3\hat{\imath} + 3\hat{\jmath}$

      $\vec{b} = -4\hat{\imath} + 4\hat{\jmath}$

b) $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}| \cdot \cos\theta$

      $\cos\theta = \dfrac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|}$

      $\downarrow$

      $\cos\theta = \dfrac{0}{3\sqrt{2} \cdot 4\sqrt{2}} = 0$

$\theta = \cos^{-1} 0 = 90°$

$\vec{a} \cdot \vec{b} = (3\hat{\imath} + 3\hat{\jmath})(-4\hat{\imath} + 4\hat{\jmath})$

     $= (-12) + (+12) = 0$

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

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

2. $\vec{C} = (3\hat{i} + 3\hat{j}) \times (-4\hat{i} + 4\hat{j})$

$= (3\hat{i}) \times (-4\hat{i}) + (3\hat{i}) \times (4\hat{j}) + (3\hat{j}) \times (-4\hat{i})$
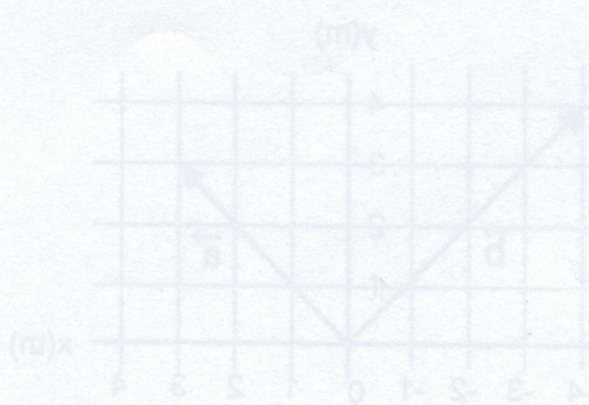
$+ (3\hat{j}) \times (4\hat{j})$

$= 12\hat{k} + (-12)(-\hat{k})$

$= 24\hat{k}$

$\vec{C} = \vec{a} \times \vec{b} = |\vec{a}||\vec{b}|\sin\theta$

$\sin 0 = 0$

$\sin 90 = 1$