



Subject: Numerical methods

Chapter: Vectors

Category: Practice questions

1. Find the sum of the vectors

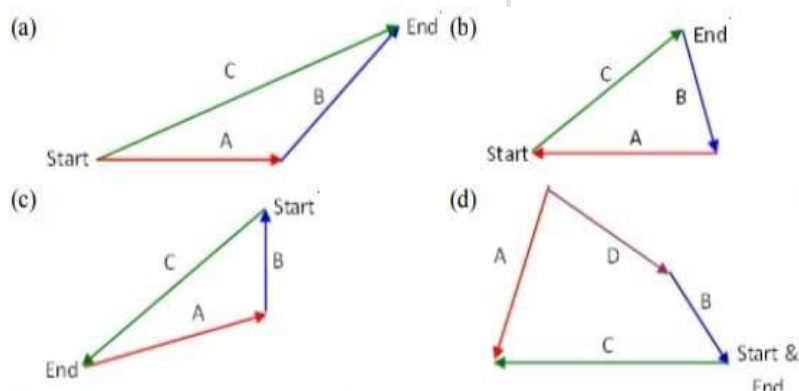
i)

$$\overrightarrow{PQ} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \text{ and } \overrightarrow{QR} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$$

ii)

$$\vec{a} = \hat{i} - 2\hat{j} + \hat{k}, \vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k} \text{ and } \vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}.$$

2. Write vector equations for each of the following diagram:



3. Find the value of cross product of two vectors:

$$(\vec{a} - \vec{b}) \times (\vec{a} + \vec{b})$$

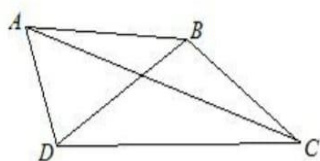
4. Find the dot product of vectors $\hat{i} + 2\hat{j} - 3\hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$

5. If $\mathbf{a} = (1, -3, 2)$ and $\mathbf{b} = (3, 4, -5)$, what is $\mathbf{b} - \mathbf{a}$?

6. If $\mathbf{a} = (4, 5, 6)$ and $\mathbf{b} = (1, 2, 3)$, and $\mathbf{c} = \mathbf{a} - 2\mathbf{b}$, what is the magnitude of $\mathbf{c}$?

7. The magnitude of a given vector with end points $(4, -4, 0)$ and $(-2, -2, 0)$ will be?

8. ABCD is a quadrilateral. Simplify the following:



a) $\overrightarrow{DC} + \overrightarrow{CA} =$

b) $\overrightarrow{BD} + \overrightarrow{DC} + \overrightarrow{CA} =$

9. Which one of the following is not a unit vector?

A $\mathbf{a} = (0, 1, 0)$

B $\mathbf{b} = (0, 0, 1)$

C

D $\mathbf{d} = (1, 1, 1)$

$$\mathbf{c} = \left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right)$$

10. Find a vector of magnitude 11 in the direction opposite to that of PQ where P and Q are the points (1,3,2) and (-1,0,8) respectively.

11. Find the vector parallel to the vector $i-2j$ and has magnitude 10 units.

12. Vector $\mathbf{a}$ has magnitude 3, vector $\mathbf{b}$ has magnitude 4, the angle between $\mathbf{a}$ and $\mathbf{b}$ is 30° and $\mathbf{n}$ is the unit vector at right angles to both $\mathbf{a}$ and $\mathbf{b}$. What is $\mathbf{a} \times \mathbf{b}$?

13. Derive the Dot Product.

14. Find the vector joining the points P(2,3,0) and Q(-1,-2,4) and also direction cosines PQ

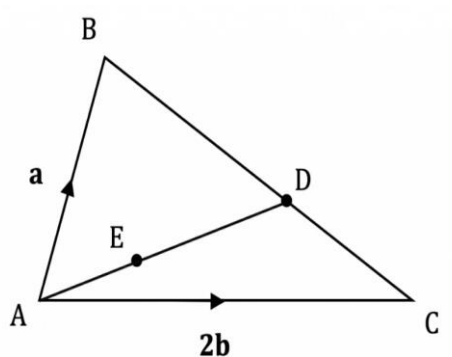
15.

1) Consider the points P and Q with position vectors $\overrightarrow{OP} = 3\mathbf{a} - 2\mathbf{b}$ and $\overrightarrow{OQ} = \mathbf{a} + \mathbf{b}$.

Find the position vector of a point R which divides line joining

the points P and Q in the ratio 2 : 1 internally and externally respectively.

16. The diagram shows a scalene triangle, ABC with vectors $\overrightarrow{AB} = \mathbf{a}$ and $\overrightarrow{AC} = 2\mathbf{b}$. The point D is positioned on the line BC such that $BD : DC = 3 : 2$. The point E is positioned on the line AD such that $AE : ED = 1 : 2$.



17. Compute the angle between two vectors $3\mathbf{i} + 4\mathbf{j} - \mathbf{k}$ and $2\mathbf{i} - \mathbf{j} + \mathbf{k}$.