CHAPTER-10
VECTOR ALGEBRA

1 EXERCISE - 10.3

1. Find the angle between two vectors $\overrightarrow{a}$ and $\overrightarrow{b}$ with magnitudes $\sqrt{3}$ and 2 respectively having $\overrightarrow{a}.\overrightarrow{b} = \sqrt{6}$.

2. Find the angle between the the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$.

3. Find the projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$.

4. Find the projection of the vector $\hat{i} + 3\hat{j} + 7\hat{k}$ on the vector $7\hat{i} - \hat{j} + 8\hat{k}$.

5. Show that each of the given three vectors is a unit vector:
   $\frac{1}{7}$ $(2\hat{i}+3\hat{j}+6\hat{k})$,$\frac{1}{7}(3\hat{i}$-$6\hat{j}+2\hat{k})$,$\frac{1}{7}(6\hat{i}+2\hat{j}$-$3\hat{k})$
   Also,show that they are mutually perpendicular to each other.

6. Find $\left|\overrightarrow{a}\right|$ and $\left|\overrightarrow{b}\right|$,if $(\overrightarrow{a} + \overrightarrow{b}).(\overrightarrow{a} - \overrightarrow{b})$=8 and $\left|\overrightarrow{a}\right|$=8$\left|\overrightarrow{b}\right|$.

7. Evaluate the product$(3\overrightarrow{a}$-$5\overrightarrow{b})$.$(2\overrightarrow{a}+7\overrightarrow{b})$.

8. Find the magnitude of two vectors $\overrightarrow{a}$ and $\overrightarrow{b}$, having the same magnitude and such that the angle between them is 60° and their scalar product is $\frac{1}{2}$

9. Find $\left|\overrightarrow{x}\right|$,if for a unit vector $\overrightarrow{a}$,$(\overrightarrow{x} - \overrightarrow{a}).(\overrightarrow{x} + \overrightarrow{a})$=12.

10. If $\overrightarrow{a}$=$2\hat{i}$+$2\hat{j}3\hat{k}$, $\overrightarrow{b} = \hat{-}i + 2\hat{j} + \hat{k}$ and $\overrightarrow{c} = 3\hat{i} + \hat{j}$ are such that $\overrightarrow{a} + \lambda\overrightarrow{b}$ is perpendicular to $\overrightarrow{c}$,then find the value of λ.

11. Show that $\left|\overrightarrow{a}\right|\overrightarrow{b} + \left|\overrightarrow{b}\right|\overrightarrow{a}$ is perpendicular to $\left|\overrightarrow{a}\right|\overrightarrow{b} - \left|\overrightarrow{b}\right|\overrightarrow{a}$, for any two nonzero vectors $\overrightarrow{a}$ and $\overrightarrow{b}$.

12. If $\overrightarrow{a}.\overrightarrow{a}$=0 and $\overrightarrow{a}.\overrightarrow{b}$=0, then what can be conculded about the vector $\overrightarrow{b}$?

13. If $\overrightarrow{a}$, $\overrightarrow{b}$, $\overrightarrow{c}$ are unit vectors such that $\overrightarrow{a} + \overrightarrow{b} + \overrightarrow{c} = \overrightarrow{0}$, find the value of $\overrightarrow{a}.\overrightarrow{b} + \overrightarrow{b}.\overrightarrow{c} + \overrightarrow{c}.\overrightarrow{a}$.

14. If either vector $\overrightarrow{a} = 0$ or $\overrightarrow{b} = 0$, then $\overrightarrow{a}.\overrightarrow{b}$=0. But the converse need not be true .Justify your answer with an example.

15. If the vertices A,B,C of a triangle ABC are (1,2,3),(-1,0,0)(0,1,2), respectively , then find $\angle ABC$. [$\angle ABC$ is the angle between the vectors $\overrightarrow{BA}$ and $\overrightarrow{BC}$].

16. show that the points A(1,2,7),B(2,6,3)and C(3,10,-1) are collinear.

17. show that the vectors $2\hat{i} - \hat{j} + \hat{k}, \hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ from the vertices of a right angled triangle.

18. If $\overrightarrow{a}$ is a nonzero vector of magnitude 'a' and λ a nonzero scalar , then $\lambda\overrightarrow{a}$ is unit vector if

    1. (A)$\lambda = 1$
    2. (B)$\lambda = -1$
    3. (C)$a = |\lambda|$
    4. (D)$a = 1/|\lambda|$