

NCERT CLASS 12

CHAPTER 10 : EXERCISE 5.13

1. The Scalar product of the Vector $(\hat{i} + \hat{j} + \hat{k})$ with a Unit Vector along the Sum of Vector $(2\hat{i} + 4\hat{j} - 5\hat{k})$ and $(\lambda\hat{i} + 2\hat{j} + 3\hat{k})$ is Equal to One. Find the Value of " λ ".

CONSTRUCTION STEPS :

- (a) Let us consider the three Different Vectors,

$$a_1\hat{i} + b_1\hat{j} + c_1\hat{k} \quad (1)$$

$$a_2\hat{i} + b_2\hat{j} + c_2\hat{k} \quad (2)$$

$$a_3\hat{i} + b_3\hat{j} + c_3\hat{k} \quad (3)$$

- (b) Let us assume, The Sum of the two Vectors, Equation(2) and Equation(3), we get

$$(a_2 + a_3)\hat{i} + (b_2 + b_3)\hat{j} + (c_2 + c_3)\hat{k} \quad (4)$$

- (c) Unit Vector of Equation(4), we get

$$\frac{(a_2 + a_3)\hat{i} + (b_2 + b_3)\hat{j} + (c_2 + c_3)\hat{k}}{\sqrt{(a_2 + a_3)^2 + (b_2 + b_3)^2 + (c_2 + c_3)^2}} \quad (5)$$

- (d) As we know that, Scalar Product of Equation(1) and Equation(5) is Equals to 1, we get

$$(a_1\hat{i} + b_1\hat{j} + c_1\hat{k}) \times \frac{(a_2 + a_3)\hat{i} + (b_2 + b_3)\hat{j} + (c_2 + c_3)\hat{k}}{\sqrt{(a_2 + a_3)^2 + (b_2 + b_3)^2 + (c_2 + c_3)^2}} = 1 \quad (6)$$

- (e) The final Equation is

$$\frac{a_1(a_2 + a_3) + b_1(b_2 + b_3) + c_1(c_2 + c_3)}{\sqrt{(a_2 + a_3)^2 + (b_2 + b_3)^2 + (c_2 + c_3)^2}} = 1 \quad (7)$$

INPUT MATRIX :

$$\begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 4 & -5 \\ \lambda & 2 & 3 \end{pmatrix}, \quad (8)$$