

12.10.3.13

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CLASS 12, CHAPTER 10, EXERCISE 3.13

- 16) If $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are unit vectors such that $\mathbf{a} + \mathbf{b} + \mathbf{c} = 0$, find the value of $\mathbf{a} \cdot \mathbf{b} + \mathbf{b} \cdot \mathbf{c} + \mathbf{c} \cdot \mathbf{a}$.

Solution: The inner product of given unit vectors with sum of all unit vectors (Which is given to be 0) is zero.

$$\mathbf{a} \cdot (\mathbf{a} + \mathbf{b} + \mathbf{c}) = 0$$

$$\Rightarrow (\mathbf{a} \cdot \mathbf{b} + \mathbf{a} \cdot \mathbf{c}) = -1$$

$$\mathbf{b} \cdot (\mathbf{a} + \mathbf{b} + \mathbf{c}) = 0$$

$$\Rightarrow (\mathbf{b} \cdot \mathbf{c} + \mathbf{b} \cdot \mathbf{a}) = -1$$

$$\mathbf{c} \cdot (\mathbf{a} + \mathbf{b} + \mathbf{c}) = 0$$

$$\Rightarrow (\mathbf{c} \cdot \mathbf{a} + \mathbf{c} \cdot \mathbf{b}) = -1$$

$$\Rightarrow (\mathbf{a} \cdot \mathbf{b} + \mathbf{b} \cdot \mathbf{c} + \mathbf{c} \cdot \mathbf{a}) = \frac{-3}{2}$$