

VECTORS

1 12th Maths - EXERCISE-10.3

1. Find $|\vec{a}|$ and $|\vec{b}|$, if $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b}) = 8$ and $|\vec{a}| = 8|\vec{b}|$.

Solution: Given points are

$$(\mathbf{a} + \mathbf{b}) \cdot (\mathbf{a} - \mathbf{b}) = 8 \quad (1)$$

$$|\mathbf{a}| = 8|\mathbf{b}| \quad (2)$$

$$(\mathbf{a} + \mathbf{b}) \cdot (\mathbf{a} - \mathbf{b}) = 8 \quad (3)$$

$$\mathbf{a} \cdot (\mathbf{a} - \mathbf{b}) + \mathbf{b} \cdot (\mathbf{a} - \mathbf{b}) = 8 \quad (4)$$

$$\mathbf{a} \cdot \mathbf{a} - \mathbf{a} \cdot \mathbf{b} + \mathbf{b} \cdot \mathbf{a} - \mathbf{b} \cdot \mathbf{b} = 8 \quad (5)$$

$$\mathbf{a} \cdot \mathbf{a} - \mathbf{a} \cdot \mathbf{b} + \mathbf{a} \cdot \mathbf{b} - \mathbf{b} \cdot \mathbf{b} = 8 \quad (6)$$

$$\mathbf{a} \cdot \mathbf{a} - \mathbf{b} \cdot \mathbf{b} = 8 \quad (7)$$

$$(|\mathbf{a}|)^2 - (|\mathbf{b}|)^2 = 8 \quad (8)$$

$$(|8\mathbf{b}|)^2 - (|\mathbf{b}|)^2 = 8 \quad (9)$$

$$64\mathbf{b}^2 - \mathbf{b}^2 = 8 \quad (10)$$

$$63\mathbf{b}^2 = 8 \quad (11)$$

$$\mathbf{b}^2 = \frac{8}{63} \quad (12)$$

$$|\mathbf{b}| = \sqrt{\frac{8}{63}} \quad (13)$$

$$|\mathbf{b}| = \frac{2\sqrt{2}}{3\sqrt{7}} \quad (14)$$

$$|\mathbf{a}| = 8 |\mathbf{b}| \quad (15)$$

$$|\mathbf{a}| = 8 \cdot \frac{2\sqrt{2}}{3\sqrt{7}} \quad (16)$$

$$|\mathbf{a}| = \frac{16\sqrt{2}}{3\sqrt{7}} \quad (17)$$