

Vector Dot Product

1 12th Maths - Chapter 10

This is Problem-9 from Exercise 10.3

1. Find $\|\mathbf{x}\|$, if for a unit vector \mathbf{a} , $(\mathbf{x} - \mathbf{a}) \cdot (\mathbf{x} + \mathbf{a}) = 12$.

Solution:

$$(\mathbf{x} - \mathbf{a})^\top (\mathbf{x} + \mathbf{a}) = 12$$

$$\mathbf{x} \cdot \mathbf{x} - \mathbf{x} \cdot \mathbf{a} + \mathbf{a} \cdot \mathbf{x} - \mathbf{a} \cdot \mathbf{a} = 12$$

$$\|\mathbf{x}\|^2 - \|\mathbf{a}\|^2 = 12$$

$$\|\mathbf{x}\|^2 - 1 = 12$$

$$\|\mathbf{x}\|^2 = 13$$

$$\|\mathbf{x}\| = \sqrt{13}$$