

VECTOR ALGEBRA

January 22, 2023

1. **Problem statement :** Evaluate the product $(3\bar{a} - 5\bar{b}) \cdot (2\bar{a} + 7\bar{b})$
Solution:

$$(3\mathbf{a} - 5\mathbf{b}) \cdot (2\mathbf{a} + 7\mathbf{b}) = 3\mathbf{a} \cdot 2\mathbf{a} + 3\mathbf{a} \cdot 7\mathbf{b} - 5\mathbf{b} \cdot 2\mathbf{a} - 5\mathbf{b} \cdot 7\mathbf{b} \quad (1)$$

Properties of Vector

$$\mathbf{a} \cdot \mathbf{a} = |\mathbf{a}|^2 \quad (2)$$

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

By using (2) and (3)

$$(3\mathbf{a} - 5\mathbf{b}) \cdot (2\mathbf{a} + 7\mathbf{b}) = 6|\mathbf{a}|^2 + 21\mathbf{a} \cdot \mathbf{b} - 10\mathbf{b} \cdot \mathbf{a} - 35|\mathbf{b}|^2 \quad (4)$$

$$= 6|\mathbf{a}|^2 - 35|\mathbf{b}|^2 + 11\mathbf{a} \cdot \mathbf{b} \quad (5)$$

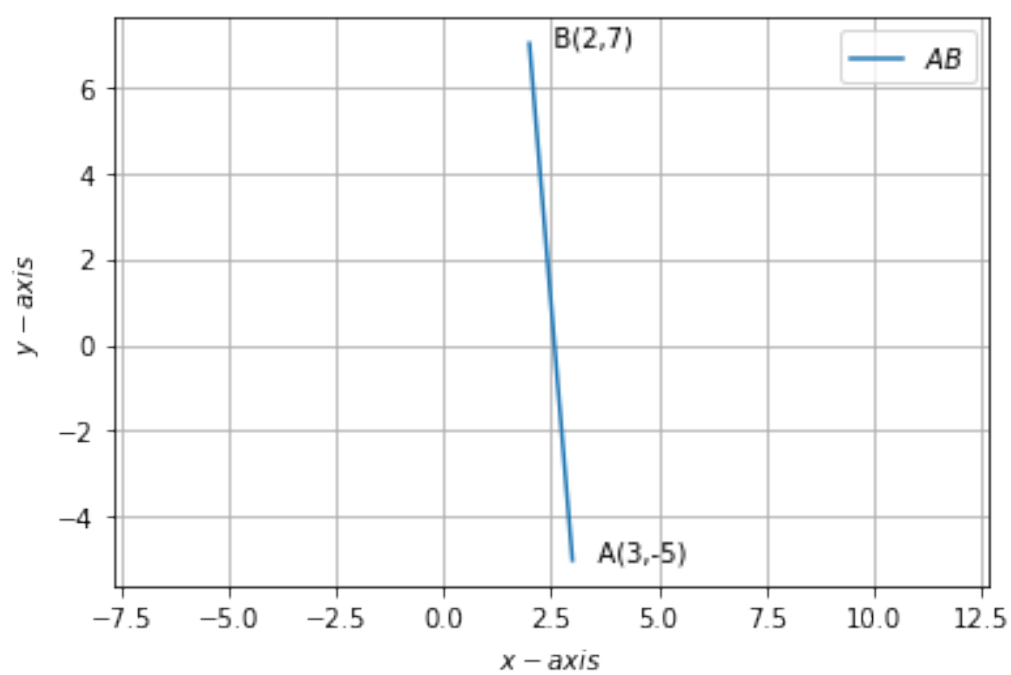


Figure 1