

## Class 12

### Chapter 10 - Vector Algebra

This is question 18 from exercise 10.5

1. The value of  $\hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j})$  is

- a) 0                      b) -1                      c) 1                      d) 3

**Solution:**

$$\begin{array}{l|l} \hat{i} \times \hat{j} = \hat{k} & \hat{j} \times \hat{i} = -\hat{k} \\ \hat{j} \times \hat{k} = \hat{i} & \hat{k} \times \hat{j} = -\hat{i} \\ \hat{k} \times \hat{i} = \hat{j} & \hat{i} \times \hat{k} = -\hat{j} \end{array}$$

Now,

$$\begin{aligned} \hat{i} \cdot (\hat{j} \times \hat{k}) + \hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{k} \cdot (\hat{i} \times \hat{j}) \\ = \hat{i} \cdot (\hat{i}) + \hat{j} \cdot (-\hat{j}) + \hat{k} \cdot (\hat{k}) \\ = \hat{i} \cdot \hat{i} - \hat{j} \cdot \hat{j} + \hat{k} \cdot \hat{k} \end{aligned}$$

$\begin{aligned} \hat{i} \cdot \hat{i} &=  \hat{i}   \hat{i}  \cos 0 \\ &= 1 \times 1 \times 1 \\ &= 1 \\ \text{similarly, } \hat{j} \cdot \hat{j} &= \hat{k} \cdot \hat{k} = 1 \end{aligned}$
--

$$\begin{aligned} &= 1 - 1 + 1 \\ &= 1 \end{aligned}$$

So, option (c) is correct.

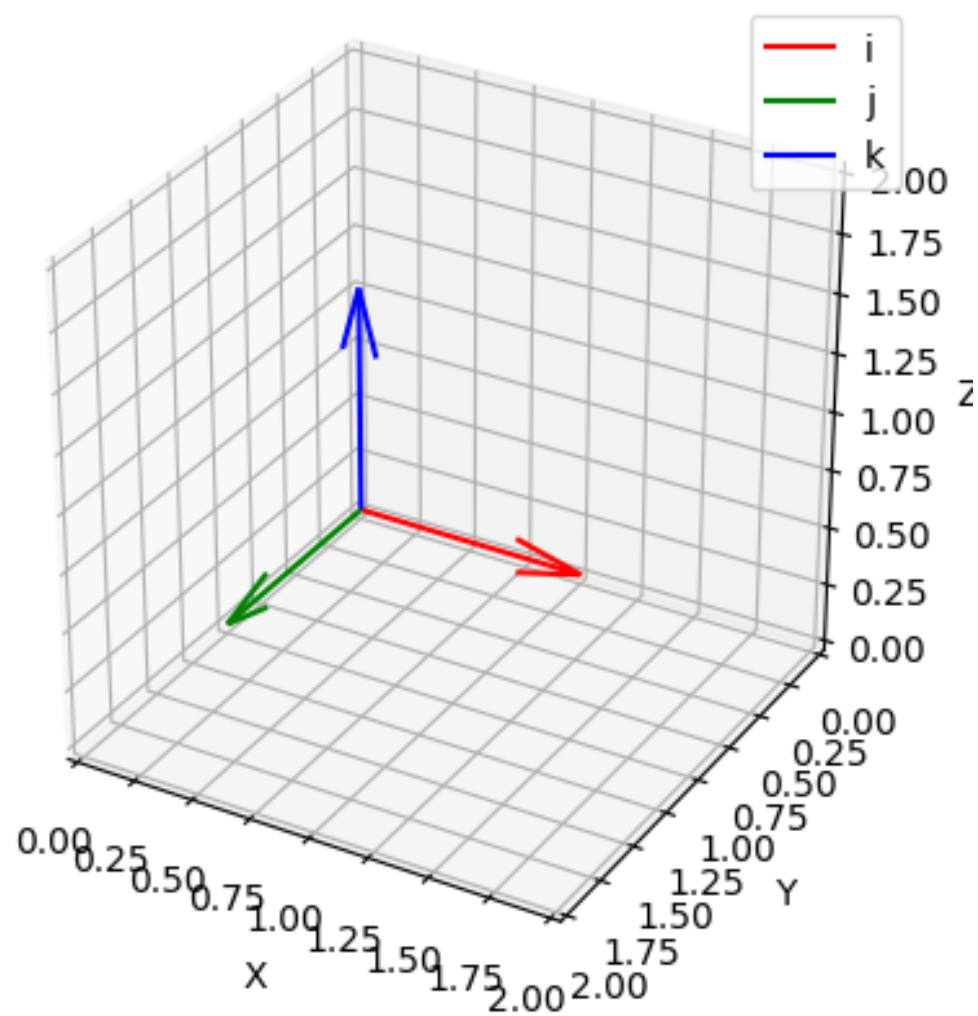


Figure 1: fig:1