Vectors

12^{th} Maths - Exercise 10.2.1

1. Compute the magnitude of the following vectors
   $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$, $\overrightarrow{b} = 2\hat{i} - 7\hat{j} + 3\hat{k}$ and $\overrightarrow{c} = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k}$.
   Solution:

$$\text{Let } \mathbf{a} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 2 \\ -7 \\ 3 \end{pmatrix}, \mathbf{c} = \begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ -\frac{1}{\sqrt{3}} \end{pmatrix} \tag{1}$$

The magnitudes of $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are $\|\mathbf{a}\|, \|\mathbf{b}\|, \|\mathbf{c}\|$ respectively so

$$\|\mathbf{a}\| = \mathbf{a}^\top \mathbf{a}, \tag{2}$$
$$\|\mathbf{b}\| = \mathbf{b}^\top \mathbf{b}, \tag{3}$$
$$\|\mathbf{c}\| = \mathbf{c}^\top \mathbf{c} \tag{4}$$

now substituting values of (1) in (2),(3) and (4) respectively we get the magnitudes of $\|\mathbf{a}\| = \sqrt{3}, \|\mathbf{b}\| = \sqrt{62}, \|\mathbf{c}\| = 1$