Equation of Unit Vector

1 12^{th} Maths - Chapter 10

This is Problem-5 from Exercise 5.5

1. Find the value of x for which $x(\hat{i}+\hat{j}+\hat{k})$ is a unit vector

2 Solution

Given points are

$$\mathbf{x} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \tag{1}$$

unit vector formula is

$$\hat{x} = \frac{1}{\|\mathbf{x}\|}\mathbf{x} \tag{2}$$

where

$$\|\mathbf{x}\| = \sqrt{\begin{pmatrix} 1 & 1 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}} \tag{3}$$

$$= \sqrt{3} \tag{4}$$

Hence ,the unit vector is

$$\hat{x} = \frac{1}{\sqrt{3}} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \tag{5}$$

$$= \begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \end{pmatrix} \tag{6}$$