

# 1.11.1

EE24BTECH11020 - Ellanti Rohith

**Question:** Find a vector  $\vec{r}$  equally inclined to the three axes and whose magnitude is  $3\sqrt{3}$  units.

**Solution:** Let  $\alpha$  be the angle made by the vector with the axes. The unit direction vector can be expressed as

$$\mathbf{x} = \begin{pmatrix} \cos \alpha \\ \cos \alpha \\ \cos \alpha \end{pmatrix} \quad (0.1)$$

$$\Rightarrow \|\mathbf{x}\| = 1 \quad (0.2)$$

$$\text{or, } \cos \alpha = \frac{1}{\sqrt{3}} \quad (0.3)$$

$$\mathbf{x} = \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k}) \quad (0.4)$$

Given that  $\|\mathbf{r}\| = 3\sqrt{3}$ , we have:

$$\|\mathbf{r}\| = 3\sqrt{3} \quad (0.5)$$

$$\mathbf{x} = \frac{\mathbf{r}}{\|\mathbf{r}\|} \quad (0.6)$$

$$\Rightarrow \mathbf{r} = \mathbf{x} \|\mathbf{r}\| \quad (0.7)$$

$$\text{Thus, the vector } \mathbf{r} = (3\hat{i} + 3\hat{j} + 3\hat{k}) \quad (0.8)$$

Vector  $\vec{r}$ 

— Vector  $\vec{r}$   
• Endpoint of  $\vec{r}$

