

# Question: 12.10.5.11

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## 1 PROBLEM

Show that direction cosines of a vector equally inclined to axes **OX**, **OY** and **OZ** are  $\pm \left( \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \right)$

## 2 SOLUTION

The vector is equally inclined to the axes **OX**, **OY** and **OZ**. Let the angle be  $\theta$ .

Direction cosines,

$$\mathbf{m} = \begin{pmatrix} \cos \theta_1 \\ \cos \theta_2 \\ \cos \theta_3 \end{pmatrix} = \begin{pmatrix} \cos \theta \\ \cos \theta \\ \cos \theta \end{pmatrix} \quad (2.0.1)$$

we know that

$$\|\mathbf{m}\| = 1 \quad (2.0.2)$$

$$\left| \sqrt{3} \cos \theta \right| = 1 \quad (2.0.3)$$

$$\cos \theta = \pm \frac{1}{\sqrt{3}} \quad (2.0.4)$$

$$\mathbf{m} = \pm \begin{pmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \end{pmatrix} \quad (2.0.5)$$

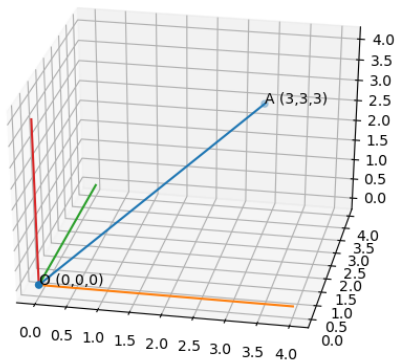


Fig. 0: vector OA, that makes equal angles with axes