

## Matgeo-2.2.11

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## Question

The plane  $2x - 3y + 6z - 11 = 0$  makes an angle  $\sin^{-1}(\alpha)$  with the x-axis. Find  $\alpha$ .

## Solution

Normal vector of the plane be  $\vec{n} = \begin{pmatrix} 2 \\ -3 \\ 6 \end{pmatrix}$

Direction vector of x-axis  $\vec{a} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$

$\theta$  is the angle between normal and x-axis

$$\cos \theta = \frac{\vec{n} \cdot \vec{a}}{\|\vec{n}\| \|\vec{a}\|} = \frac{2}{\sqrt{2^2 + (-3)^2 + 6^2}} = \frac{2}{7}$$

# Conclusion

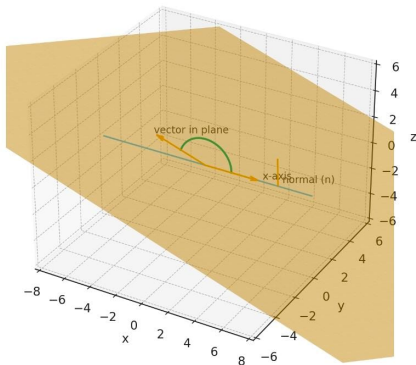
Angle between plane and x-axis  $= 90^\circ - \theta$ .

$$\alpha = \sin(90^\circ - \theta) = \cos \theta = \frac{2}{7}$$

Therefore,  $\alpha = 2/7$ .

# Graphical Representation

Plane  $2x - 3y + 6z - 11 = 0$ , x-axis, a vector in the plane and the normal  
(arc shows angle between x-axis and the plane)



Figure