

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.
The value of α is equal to

Solution

Let the normal vector of the plane be $\vec{n} = 2\hat{i} - 3\hat{j} + 6\hat{k}$.

The x-axis has direction vector $\vec{a} = \hat{i}$.

The cosine of the angle θ between the normal and x-axis:

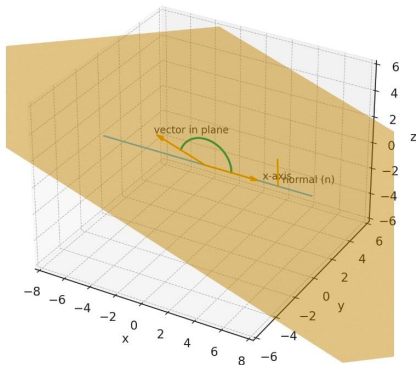
$$\cos \theta = \frac{\vec{n} \cdot \vec{a}}{|\vec{n}| \cdot |\vec{a}|} = \frac{2}{\sqrt{2^2 + (-3)^2 + 6^2}} = \frac{2}{7}$$

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

Thus, $\alpha = \sin(90^\circ - \theta) = \cos \theta = \frac{2}{7}$ So, the value of α is $2/7$.

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