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ASSIGNMENT 1

Lines and Planes

Problem Statement

Find the equations of the lines which intercepts on the both the axes and whose sum and product are 1 and -6 respectively.

Solution

The equation of a straight line is given by

$$y = mx + c : \text{ where m is the slope of the line and c is the y-intercept} \quad (1)$$

Let the co-ordinates of x and y intercepts be (a,0) and (0,b) respectively.
Given data in problem statement : $a + b = 1$ and $ab = -6$

$$\implies b = \frac{-6}{a} \implies a^2 - a - 6 = 0 \implies (a-3)(a+2) = 0 \implies (a,b) = (3,-2) \text{ and } (-2,3) \quad (2)$$

Upon substituting $(a, 0)$ and $(0, b)$ in (1) we get $m = \frac{-b}{a}$ and $c = b$
Thus the equation of line in terms of x and y intercepts is $y = \frac{-b}{a}x + b$
On substituting the values of a and b we get
$y = \frac{-2}{3}x - 2$
$y = \frac{-3}{2}x + 3$
In matrix form it can be written as

$$\begin{bmatrix} \frac{2}{3} & 1 \\ \frac{3}{2} & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 3 \end{bmatrix} \quad (3)$$