5.2.22

EE25BTECH11019 - Darji Vivek M.

Question:
Solve for the system of linear equations:

$$\sqrt{2}x + \sqrt{3}y = 0$$
$$\sqrt{3}x - \sqrt{8}y = 0$$

Solution:
Let us solve the given question theoretically and then verify the solution computationally.

The equation of lines given,

$$\begin{pmatrix} \sqrt{2} & \sqrt{3} \end{pmatrix}\mathbf{x} = 0 \quad \begin{pmatrix} \sqrt{3} & -\sqrt{8} \end{pmatrix}\mathbf{x} = 0 \tag{1}$$

$$\therefore \begin{pmatrix} \sqrt{2} & \sqrt{3} \\ \sqrt{3} & -\sqrt{8} \end{pmatrix}\mathbf{x} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{2}$$

Forming an augmented matrix,

$$\left(\begin{array}{cc|c} \sqrt{2} & \sqrt{3} & 0 \\ \sqrt{3} & -\sqrt{8} & 0 \end{array}\right) \tag{3}$$

Upon doing row reduction,

$$\left(\begin{array}{cc|c} \sqrt{2} & \sqrt{3} & 0 \\ \sqrt{3} & -\sqrt{8} & 0 \end{array}\right) \xleftarrow{R_2 \leftarrow R_2 - \frac{\sqrt{3}}{\sqrt{2}} \times R_1} \left(\begin{array}{cc|c} \sqrt{2} & \sqrt{3} & 0 \\ 0 & \left(-\sqrt{8} - \frac{3}{\sqrt{2}}\right) & 0 \end{array}\right) \xleftarrow{R_1 \leftarrow R_1 + 0 \times R_2} \left(\begin{array}{cc|c} \sqrt{2} & \sqrt{3} & 0 \\ 0 & \left(-\sqrt{8} - \frac{3}{\sqrt{2}}\right) & 0 \end{array}\right)$$
$$\tag{4}$$

$$\implies \mathbf{x} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{5}$$

Intersection of Two Lines