

# 5.2.61

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**Question:** Solve the system:

$$x - y + 2z = 1$$

$$2z - 3z = 1$$

$$3x - 2y + 4z = 2$$

**Solution**

Variable
$x$
$y$
$z$

TABLE 0: Variables Used

This system of equations can be solved using an augmented matrix and Gaussian elimination

$$\left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 2 & -3 & 1 \\ 3 & -2 & 4 & 2 \end{array} \right) \xrightarrow{R_3 - 3R_1} \left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 2 & -3 & 1 \\ 0 & 1 & -2 & -1 \end{array} \right) \quad (0.1)$$

$$\xrightarrow{R_3 - \frac{1}{2}R_2} \left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 2 & -3 & 1 \\ 0 & 0 & -\frac{1}{2} & -\frac{3}{2} \end{array} \right) \quad (0.2)$$

$$\xrightarrow{R_2 \rightarrow \frac{1}{2}R_2} \left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 1 & -\frac{3}{2} & \frac{1}{2} \\ 0 & 0 & -\frac{1}{2} & -\frac{3}{2} \end{array} \right) \quad (0.3)$$

$$\xrightarrow{R_3 \rightarrow -2R_3} \left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 1 & -\frac{3}{2} & \frac{1}{2} \\ 0 & 0 & 1 & 3 \end{array} \right) \quad (0.4)$$

$$\xrightarrow{R_2 \rightarrow R_2 + \frac{3}{2}R_3} \left( \begin{array}{ccc|c} 1 & -1 & 2 & 1 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 3 \end{array} \right) \quad (0.5)$$

$$\xrightarrow{R_1 \rightarrow R_1 - 2R_3} \left( \begin{array}{ccc|c} 1 & -1 & 0 & -5 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 3 \end{array} \right) \quad (0.6)$$

$$\xrightarrow{R_1 \rightarrow R_1 + R_2} \left( \begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 3 \end{array} \right) \quad (0.7)$$

$$x = 0, \quad y = 5, \quad z = 3 \quad (0.8)$$

Refer to Figure

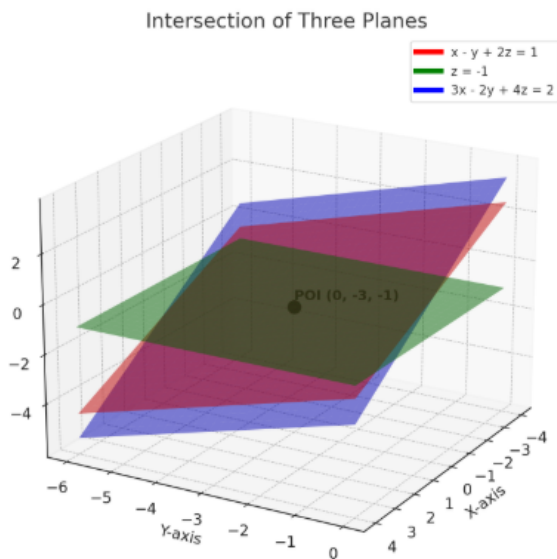


Fig. 0.1