To solve system of equations

$$\begin{aligned} a_1x + b_1y + c_1z &= d_1 \\ a_2x + b_2y + c_2z &= d_2 \\ a_3x + b_3y + c_3z &= d_3 \end{aligned}$$

$\Rightarrow$

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} d_1 \\ d_2 \\ d_3 \end{bmatrix}$$

I. Direct Method: Gauss Elimination method.

Given $Ax = B$.

i) Write $[A : B] = \left[\begin{array}{ccc|c} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \\ a_3 & b_3 & c_3 & d_3 \end{array}\right]$

ii) Use row operation.

$$[A : B] = \left[\begin{array}{ccc|c} a_1 & b_1 & c_1 & d_1 \\ 0 & b_2 & c_2 & d_2 \\ 0 & b_3 & c_3 & d_3 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} a_1 & b_1 & c_1 & d_1 \\ 0 & b_2 & c_2 & d_2 \\ 0 & 0 & c_3 & d_3 \end{array}\right]$$

iii) Convert to equation form & then solve.

Gauss Jordan method. (Direct method)

1. Write augmented form.

$$[A : B] = \left[\begin{array}{ccc|c} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \\ a_3 & b_3 & c_3 & d_3 \end{array}\right]$$

2. Use row operation where:
   - I help R_1
   - II help R_2
   - III help R_3
3. $[A : B] = \left[\begin{array}{ccc|c} 1 & 0 & 0 & d_1^* \\ 0 & 1 & 0 & d_2^* \\ 0 & 0 & 1 & d_3^* \end{array}\right]$