

1) Using matrix method, solve the system of equations  
 $3x + 2y - 2z = 3$ ,  $x + 2y + 3z = 6$ ,  $2x - y + z = 2$

Solution is

Given system of equations is:

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

$$x + 2y + 3z = 6$$

and  $2x - y + z = 2$

or  $AX = B$

i.e. 
$$\begin{bmatrix} 3 & 2 & -2 \\ 1 & 2 & 3 \\ 2 & -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 6 \\ 2 \end{bmatrix}$$

$\therefore X = A^{-1}B$

For  $A^{-1}$ ,

Cofactors are:  $A_{11} = 5, A_{12} = 5, A_{13} = -5$   
 $A_{21} = 0, A_{22} = 7, A_{23} = 7$   
 $A_{31} = 10, A_{32} = -11$  and  $A_{33} = 4$

$\therefore \text{adj } A = \begin{bmatrix} 5 & 5 & -5 \\ 0 & 7 & 7 \\ 10 & -11 & 4 \end{bmatrix}^T = \begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix}$

$|A| = 3(5) + 2(5) + (-2)(-5) = 35$

$\therefore A^{-1} = \frac{\text{adj } A}{|A|} = \frac{1}{35} \begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix}$

Now  $X = A^{-1}B$ .

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{35} \begin{bmatrix} 5 & 0 & 10 \\ 5 & 7 & -11 \\ -5 & 7 & 4 \end{bmatrix} \begin{bmatrix} 3 \\ 6 \\ 2 \end{bmatrix} = \frac{1}{35} \begin{bmatrix} 15 + 20 \\ 15 + 42 - 22 \\ -15 + 42 + 8 \end{bmatrix}$$

$$= \frac{1}{35} \begin{bmatrix} 35 \\ 35 \\ 35 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$\therefore x=1, y=1$  and  $z=1$ .