

$$M = \begin{pmatrix} 17 & -11 \\ 6 & 3 \end{pmatrix}$$

$$a = 17$$

$$b = -11$$

$$c = 6$$

$$d = 3$$

$$\det(M) = ad - bc$$

$$\det(M) = (17 \times 3) - (-11 \times 6) = 15$$

$$M = \begin{pmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 3 & 4 & -5 \end{pmatrix}$$

$$a = 1, b = 1$$

$$c = 2, d = 2$$

$$e = 3, f = 1$$

$$g = 3, h = 4$$

$$\det(M) = a(ei - fh) -$$

$$b(di - fg) + c(dh - eg)$$

$$\det(M) = 1(3 \times -5 - 1 \times 4) - 1(2 \times -5 - 1 \times 3) + 2(2 \times 4 - 3 \times 3) = -8$$

$$A = \begin{pmatrix} -3 & -2 \\ 3 & 3 \end{pmatrix}$$

a, b, c, d
element of
matrix

$$A^{-1} = \frac{1}{\det(A)} * \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

$$\det(A) = ad - bc = -3$$

$$A^{-1} = \frac{1}{-3} \begin{pmatrix} 3 & 2 \\ -3 & -3 \end{pmatrix} = \begin{pmatrix} -1 & -\frac{2}{3} \\ 1 & 1 \end{pmatrix}$$

$$A = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}, \det(A) = a(ei - fh) - b(di - fg) + c(dh - eg)$$

$$\det(A) = 1(1*1 - 1*1) - 0(0*1 - 1*2) + 1(0*1 - 1*1) = -1$$

$$A^{-1} = \frac{1}{\det(A)} * \text{Adj}(A)$$

$$\text{Adj}(A) = A^T$$

$$= \begin{pmatrix} 0 & -1 & -1 \\ -1 & 0 & -1 \\ -1 & -1 & -1 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

$$x_1 + 4x_2 + 3x_3 - x_4 = 5$$

$$x_1 - x_2 + x_3 + 2x_4 = 6$$

$$4x_1 + x_2 + 6x_3 + 5x_4 = 9$$

matrix :-

$$\begin{pmatrix} 1 & 4 & 3 & -1 & 5 \\ 1 & -1 & 1 & 2 & 6 \\ 4 & 1 & 6 & 5 & 9 \end{pmatrix}$$

→ Gaussian Elimination:

① subtract the first row from the second row

$$\begin{pmatrix} 1 & 4 & 3 & -1 & 5 \\ 0 & -5 & -2 & 3 & 1 \\ 4 & 1 & 6 & 5 & 9 \end{pmatrix}$$

② subtract 4 times the first row from third row:

$$\begin{pmatrix} 1 & 4 & 3 & -1 & 5 \\ 0 & -5 & -2 & 3 & 1 \\ 0 & -15 & -6 & 9 & -11 \end{pmatrix}$$

→ Eliminate x_2 from the third row :-

① Divide the second row by -5

$$\begin{pmatrix} 1 & 4 & 3 & -1 & 5 \\ 0 & 1 & 2/5 & -3/5 & -1/5 \\ 0 & -15 & -6 & 9 & -11 \end{pmatrix}$$

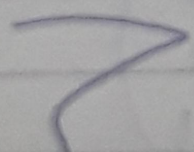
② Add 15 times the second row to the third row:

$$\begin{pmatrix} 1 & 4 & 3 & -1 & 5 \\ 0 & 1 & 2/5 & -3/5 & -1/5 \\ 0 & 0 & 0 & 0 & -2 \end{pmatrix}$$

• BACK Substitution:-

in the last row: $0 = -2$ then

has no solution



$$\begin{aligned}x_1 - 2x_2 + x_3 - x_4 &= 3 \\ 2x_1 - 4x_2 + x_3 + x_4 &= 2 \\ x_1 - 2x_2 - 2x_3 + 3x_4 &= 1\end{aligned}$$

⇒ system matrix:

$$\begin{pmatrix} 1 & -2 & 1 & -1 & 3 \\ 2 & -4 & 1 & 1 & 2 \\ 1 & -2 & -2 & 3 & 1 \end{pmatrix}$$

⇒ Gaussian Elimination:

① ~~Gaussian Elimination:~~

① Eliminate x_1 from the second & third rows

⇒ Subtract 2 times the first row from the second row:

$$\begin{pmatrix} 1 & -2 & 1 & -1 & 3 \\ 0 & 0 & -1 & 3 & -4 \\ 1 & -2 & -2 & 3 & 1 \end{pmatrix}$$

⇒ Subtract the first row from the third row:

$$\begin{pmatrix} 1 & -2 & 1 & -1 & 3 \\ 0 & 0 & -1 & 3 & -4 \\ 0 & 0 & -3 & 4 & -2 \end{pmatrix}$$

② Eliminate x_3 from the third row:-

→ multiply the second row by 3

$$\begin{pmatrix} 1 & -2 & 1 & -1 & 3 \\ 0 & 0 & -3 & 9 & -12 \\ 0 & 0 & -3 & 4 & -2 \end{pmatrix}$$

→ Subtract the second row from the third row:

$$\begin{pmatrix} 1 & -2 & 1 & -1 & 3 \\ 0 & 0 & -3 & 9 & -12 \\ 0 & 0 & 0 & -5 & 10 \end{pmatrix}$$

③ Solve for x_4 :- $-5x_4 = 10 \Rightarrow \boxed{x_4 = -2}$

④ Back Substitution:

$$-3x_3 + 9(-2) = -12$$

$$-3x_3 - 18 = -12 \Rightarrow \boxed{x_3 = -2}$$

$$x_1 - 2x_2 = 3 \Rightarrow \boxed{x_1 = 3 + 2t} \text{ where } \boxed{x_2 = t}$$

So, the solution set is:

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 3 + 2t \\ t \\ -2 \\ -2 \end{pmatrix}$$