

Práctica 3 : Matrices Inversas

1: Mediante el Método de G-J (Tipo I), determinar la inversa de las siguientes matrices.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$$

$$\begin{array}{l} (-3) \rightarrow \\ + \rightarrow \end{array} \begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 5 & 0 & 1 \\ \hline 1 & 2 & 1 & 0 \\ (-1) & 0 & -1 & -3 & 1 \\ + \rightarrow \\ (-2) & 1 & 2 & 1 & 0 \\ 0 & 1 & 3 & -1 \\ \hline 1 & 0 & -5 & 2 \\ 0 & 1 & 3 & -1 \end{array}$$

$$A^{-1} = \begin{bmatrix} -5 & 2 \\ 3 & -1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$$

$$\begin{array}{l} (+4) \rightarrow \\ +L \rightarrow \\ + \rightarrow \\ (-2) \rightarrow \end{array} \begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 4 & 9 & 0 & 1 \\ \hline 1 & 2 & 1 & 0 \\ 0 & 1 & -4 & 1 \\ \hline 1 & 0 & 9 & -2 \\ 0 & 1 & -4 & 1 \end{array}$$

$$B^{-1} = \begin{bmatrix} 9 & -2 \\ -4 & 1 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$$

$$\begin{array}{l} (-3) \rightarrow \\ +L \rightarrow \end{array} \begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 6 & 0 & 1 \\ \hline 1 & 2 & 1 & 0 \\ 0 & 0 & -3 & -3 \end{array}$$

$$C^{-1} = \notin \text{ No existe su Inversa}$$

$$D = \begin{bmatrix} 1 & 3 \\ 2 & 8 \end{bmatrix}$$

$$\begin{array}{l} (-2) \rightarrow \\ +L \rightarrow \\ (\frac{1}{2}) \rightarrow \\ + \rightarrow \\ (-3) \rightarrow \end{array} \begin{array}{cc|cc} 1 & 3 & 1 & 0 \\ 2 & 8 & 0 & 1 \\ \hline 1 & 3 & 1 & 0 \\ 0 & 2 & -2 & 1 \\ \hline 1 & 3 & 1 & 0 \\ 0 & 1 & -1 & \frac{1}{2} \\ \hline 1 & 0 & 4 & -\frac{3}{2} \\ 0 & 1 & -1 & \frac{1}{2} \end{array}$$

$$D^{-1} = \begin{bmatrix} 4 & -3/2 \\ -1 & 1/2 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 7 & 6 \\ 8 & 9 & 3 \\ 4 & 5 & 2 \end{bmatrix}$$

$$\begin{array}{l} \textcircled{-4} \textcircled{-8} \begin{array}{l} +L \rightarrow \\ + \end{array} \end{array} \begin{array}{ccc|ccc} 1 & 7 & 6 & 1 & 0 & 0 \\ 8 & 9 & 3 & 0 & 1 & 0 \\ 4 & 5 & 2 & 0 & 0 & 1 \end{array}$$

$$\begin{array}{l} \textcircled{-1/42} \end{array} \begin{array}{ccc|ccc} 1 & 7 & 6 & 1 & 0 & 0 \\ 0 & -47 & -45 & -8 & 1 & 0 \\ 0 & -23 & -22 & -4 & 0 & 1 \end{array}$$

$$\begin{array}{l} + \rightarrow \end{array} \begin{array}{ccc|ccc} 1 & 7 & 6 & 1 & 0 & 0 \\ 0 & 1 & 45/47 & 8/47 & -1/47 & 0 \\ 0 & -23 & -22 & -4 & 0 & 1 \end{array}$$

$$\textcircled{-7} \textcircled{(23)} \begin{array}{l} +L \rightarrow \\ + \end{array} \begin{array}{ccc|ccc} 1 & 0 & -33/47 & -9/47 & 7/47 & 0 \\ 0 & 1 & 45/47 & 8/47 & -1/47 & 0 \\ 0 & 0 & 1/47 & -4/47 & -23/47 & 1 \end{array}$$

$$\begin{array}{l} + \rightarrow \\ + \end{array} \begin{array}{ccc|ccc} 1 & 0 & -33/47 & -9/47 & 7/47 & 0 \\ 0 & 1 & 45/47 & 8/47 & -1/47 & 0 \\ 0 & 0 & 1 & -4/47 & -23/47 & 1 \end{array}$$

$$\textcircled{(33/47)} \textcircled{(-45/47)} \begin{array}{l} +L \rightarrow \\ + \end{array} \begin{array}{ccc|ccc} 1 & 0 & 0 & -3 & -16 & 33 \\ 0 & 1 & 0 & 4 & 22 & -45 \\ 0 & 0 & 1 & -4 & -23 & 47 \end{array}$$

$$A^{-1} = \begin{bmatrix} -3 & -16 & 33 \\ 4 & 22 & -45 \\ -4 & -23 & 47 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 9 & 5 \\ 4 & 2 & 3 \\ 8 & 6 & 7 \end{bmatrix}$$

$$\begin{array}{l} \textcircled{-8} \textcircled{-4} \begin{array}{l} +L \rightarrow \\ + \end{array} \end{array} \begin{array}{ccc|ccc} 1 & 9 & 5 & 1 & 0 & 0 \\ 4 & 2 & 3 & 0 & 1 & 0 \\ 8 & 6 & 7 & 0 & 0 & 1 \end{array}$$

$$\begin{array}{l} \textcircled{-1/34} \end{array} \begin{array}{ccc|ccc} 1 & 9 & 5 & 1 & 0 & 0 \\ 0 & -34 & -17 & -4 & 1 & 0 \\ 0 & -66 & -33 & -8 & 0 & 1 \end{array}$$

$$\begin{array}{l} + \rightarrow \\ + \end{array} \begin{array}{ccc|ccc} 1 & 9 & 5 & 1 & 0 & 0 \\ 0 & 1 & 1/2 & 2/17 & -1/34 & 0 \\ 0 & -66 & -33 & -8 & 0 & 1 \end{array}$$

$$\textcircled{-9} \textcircled{(66)} \begin{array}{l} +L \rightarrow \\ + \end{array} \begin{array}{ccc|ccc} 1 & 0 & 1/2 & -1/17 & 9/34 & 0 \\ 0 & 1 & 1/2 & 2/17 & -1/34 & 0 \\ 0 & 0 & 0 & -4/17 & -33/17 & 1 \end{array}$$

$$B^{-1} = \nexists \text{ No Existe su Inversa}$$

$$C = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{c} \xrightarrow{+} \\ \textcircled{-1} \end{array} \begin{array}{ccc|ccc} 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ \hline 1 & 0 & 0 & 1 & -1 & 0 \\ \xrightarrow{+} \\ \textcircled{-1} \end{array} \begin{array}{ccc|ccc} 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ \hline 1 & 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & 0 & 1 & -1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{array}$$

$$C^{-1} = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 7 & 9 \\ 1 & 3 & 3 \end{bmatrix}$$

$$\begin{array}{c} \textcircled{-1} \quad \textcircled{-3} \\ +L \rightarrow \\ \xrightarrow{+} \\ \xrightarrow{+} \\ \textcircled{-2} \quad \textcircled{-1} \\ +L \rightarrow \end{array} \begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 3 & 7 & 9 & 0 & 1 & 0 \\ 1 & 3 & 3 & 0 & 0 & 1 \\ \hline 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 1 & 0 & -3 & 1 & 0 \\ \hline 0 & 1 & 0 & -1 & 0 & 1 \\ 1 & 0 & 3 & 7 & -2 & 0 \\ 0 & 1 & 0 & -3 & 1 & 0 \\ 0 & 0 & 0 & 2 & -1 & 1 \end{array}$$

$D^{-1} = \text{No existe su Inversa}$

$$E = \begin{bmatrix} 1 & -2 & 4 \\ 3 & -5 & 9 \\ 4 & -6 & 12 \end{bmatrix}$$

$$\begin{array}{c}
 \begin{array}{cc}
 (-4) & (-3) \\
 + & L \\
 \rightarrow & \\
 + & \\
 \rightarrow &
 \end{array}
 \begin{array}{ccc|ccc}
 1 & -2 & 4 & 1 & 0 & 0 \\
 3 & -5 & 9 & 0 & 1 & 0 \\
 4 & -6 & 12 & 0 & 0 & 1 \\
 1 & -2 & 4 & 1 & 0 & 0 \\
 0 & 1 & -3 & -3 & 1 & 0 \\
 0 & 2 & -4 & -4 & 0 & 1 \\
 1 & 0 & -2 & -5 & 2 & 0 \\
 0 & 1 & -3 & -3 & 1 & 0 \\
 (1/2) & 0 & 2 & 2 & -2 & 1 \\
 1 & 0 & -2 & -5 & 2 & 0 \\
 0 & 1 & -3 & -3 & 1 & 0 \\
 0 & 0 & 1 & 1 & -1 & 1/2 \\
 1 & 0 & 0 & -3 & 0 & 1 \\
 0 & 1 & 0 & 0 & -2 & 3/2 \\
 0 & 0 & 1 & 1 & -1 & 1/2
 \end{array}
 \end{array}$$

$$E^{-1} = \begin{bmatrix} -3 & 0 & 1 \\ 0 & -2 & 3/2 \\ 1 & -1 & 1/2 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 10 & 6 \\ 2 & 6 & 5 \end{bmatrix}$$

$$\begin{array}{c}
 \begin{array}{cc}
 (-2) & (-3) \\
 + & L \\
 \rightarrow & \\
 + & \\
 \rightarrow &
 \end{array}
 \begin{array}{ccc|ccc}
 1 & 3 & 2 & 1 & 0 & 0 \\
 3 & 10 & 6 & 0 & 1 & 0 \\
 2 & 6 & 5 & 0 & 0 & 1 \\
 1 & 3 & 2 & 1 & 0 & 0 \\
 0 & 1 & 0 & -3 & 1 & 0 \\
 0 & 0 & 1 & -2 & 0 & 1 \\
 1 & 0 & 2 & 10 & -3 & 0 \\
 0 & 1 & 0 & -3 & 1 & 0 \\
 0 & 0 & 1 & -2 & 0 & 1 \\
 1 & 0 & 0 & 14 & -3 & -2 \\
 0 & 1 & 0 & -3 & 1 & 0 \\
 0 & 0 & 1 & -2 & 0 & 1
 \end{array}
 \end{array}$$

$$F^{-1} = \begin{bmatrix} 14 & -3 & -2 \\ -3 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$$

$$G = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 2 \\ 3 & 7 & 7 \end{bmatrix}$$

$$\begin{array}{ccc|ccc} \textcircled{-3} & \textcircled{-1} & 1 & 2 & 3 & 1 & 0 & 0 \\ + \swarrow & + \searrow & 1 & 2 & 2 & 0 & 1 & 0 \\ + \swarrow & + \searrow & 3 & 7 & 7 & 0 & 0 & 1 \\ \hline & & 1 & 2 & 3 & 1 & 0 & 0 \\ & & 0 & 0 & -1 & -1 & 1 & 0 \\ \textcircled{-1/2} & & 0 & 1 & -2 & -3 & 0 & 1 \\ + \swarrow & + \searrow & 1 & 2 & 3 & 1 & 0 & 0 \\ + \swarrow & + \searrow & 0 & 0 & -1 & -1 & 1 & 0 \\ \textcircled{-3} & \textcircled{-1} & 0 & -1/2 & 1 & 3/2 & 0 & -1/2 \\ & & 1 & 7/2 & 0 & -7/2 & 0 & 3/2 \\ \textcircled{-2} & & 0 & -1/2 & 0 & 1/2 & 1 & -1/2 \\ & & 0 & -1/2 & 1 & 3/2 & 0 & -1/2 \\ + \swarrow & + \searrow & 1 & 7/2 & 0 & -7/2 & 0 & 3/2 \\ \textcircled{1/2} & \textcircled{-7/2} & 0 & 1 & 0 & -1 & -2 & 1 \\ + \swarrow & + \searrow & 0 & -1/2 & 1 & 3/2 & 0 & -1/2 \\ & & 1 & 0 & 0 & 0 & 7 & -2 \\ & & 0 & 1 & 0 & -1 & -2 & 1 \\ & & 0 & 0 & 1 & 1 & -1 & 0 \end{array}$$

$$G^{-1} = \begin{bmatrix} 0 & 7 & -2 \\ -1 & -2 & 1 \\ 1 & -1 & 0 \end{bmatrix}$$

$$H = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

$$\begin{array}{ccc|ccc} \textcircled{1/3} & 1 & 0 & 0 & 1 & 0 & 0 \\ & 0 & 3 & 0 & 0 & 1 & 0 \\ & 0 & 0 & 2 & 0 & 0 & 1 \\ \hline & 1 & 0 & 0 & 1 & 0 & 0 \\ & 0 & 1 & 0 & 0 & 1/3 & 0 \\ \textcircled{1/2} & 0 & 0 & 2 & 0 & 0 & 1 \\ \hline & 1 & 0 & 0 & 1 & 0 & 0 \\ & 0 & 1 & 0 & 0 & 1/3 & 0 \\ & 0 & 0 & 1 & 0 & 0 & 1/2 \end{array}$$

$$H^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/3 & 0 \\ 0 & 0 & 1/2 \end{bmatrix}$$

$\begin{pmatrix} -14 \\ -3 \\ -2 \end{pmatrix}$	1	2	1	3	1	0	0	0
$\begin{matrix} + \\ + \\ + \end{matrix}$	2	5	4	5	0	1	0	0
	3	9	10	9	0	0	1	0
	4	11	12	16	0	0	0	1
$\begin{pmatrix} -2 \\ -3 \\ -3 \end{pmatrix}$	1	2	1	3	1	0	0	0
$\begin{matrix} + \\ + \\ + \end{matrix}$	0	1	2	-1	-2	1	0	0
	0	3	7	0	-3	0	1	0
	0	3	8	4	-4	0	0	1
$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$	1	0	-3	5	5	-2	0	0
$\begin{matrix} + \\ + \\ + \end{matrix}$	0	1	2	-1	-2	1	0	0
	0	0	1	3	3	-3	1	0
	0	0	2	7	2	-3	0	1
$\begin{pmatrix} -14 \\ 7 \\ -3 \end{pmatrix}$	1	0	0	14	14	-11	3	0
$\begin{matrix} + \\ + \\ + \end{matrix}$	0	1	0	-7	-8	7	-2	0
	0	0	1	3	3	-3	1	0
	0	0	0	1	-4	3	-2	1
	1	0	0	0	70	-53	31	-14
	0	1	0	0	-36	28	-16	7
	0	0	1	0	15	-12	7	-3
	0	0	0	1	-4	3	-2	1

$$A^{-1} = \begin{bmatrix} 70 & -63 & 31 & -14 \\ -36 & 28 & -16 & 7 \\ 15 & -12 & 7 & -3 \\ -4 & 3 & -2 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 3 & 2 & 5 \\ 6 & 4 & 7 & 8 \\ 9 & 0 & 2 & 1 \\ 5 & 2 & 3 & 4 \end{bmatrix}$$

$-\textcircled{5}$	$-\textcircled{9}$	$-\textcircled{6}$	1	3	2	5	1	0	0	0
		$+\rightarrow$	6	4	7	8	0	1	0	0
$+$	$+$	$\rightarrow$	9	0	2	1	0	0	1	0
$+$		$\rightarrow$	5	2	3	4	0	0	0	1
			1	3	2	5	1	0	0	0
	$-\textcircled{\frac{1}{14}}$		0	-14	-5	-22	-6	1	0	0
			0	-27	-16	-44	-9	0	1	0
			0	-13	-7	-21	-5	0	0	1

$$\begin{array}{c}
 \begin{array}{c} + \\ \rightarrow \end{array} \begin{array}{c} \textcircled{-3} \quad \textcircled{13} \quad \textcircled{27} \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \\
 \begin{array}{cccc|cccc}
 1 & 3 & 2 & 5 & 1 & 0 & 0 & 0 \\
 0 & 1 & 5/14 & 11/7 & 3/7 & -1/14 & 0 & 0 \\
 0 & -27 & -16 & -44 & -9 & 0 & 1 & 0 \\
 0 & -13 & -7 & -21 & -5 & 0 & 0 & 1
 \end{array}
 \end{array}$$

$(-14/89)$

$$\begin{array}{c}
 \begin{array}{c} + \\ \rightarrow \end{array} \begin{array}{c} \textcircled{-13/14} \quad \textcircled{33/14} \quad \textcircled{-5/14} \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \\
 \begin{array}{cccc|cccc}
 1 & 0 & 13/14 & 2/7 & -2/7 & 3/14 & 0 & 0 \\
 0 & 1 & 5/14 & 11/7 & 3/7 & -1/14 & 0 & 0 \\
 0 & 0 & 1 & 22/89 & -36/89 & 27/89 & -14/89 & 0 \\
 0 & 0 & -33/14 & -4/7 & 4/7 & -13/14 & 0 & 1
 \end{array}
 \end{array}$$

$$\begin{array}{c}
 \begin{array}{c} + \\ \rightarrow \end{array} \begin{array}{c} \textcircled{89} \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \\
 \begin{array}{cccc|cccc}
 1 & 0 & 0 & 5/89 & 8/89 & -6/89 & 13/89 & 0 \\
 0 & 1 & 0 & 132/89 & 51/89 & -16/89 & 5/89 & 0 \\
 0 & 0 & 1 & 22/89 & -36/89 & 27/89 & -14/89 & 0 \\
 0 & 0 & 0 & 1/89 & -34/89 & -19/89 & -33/89 & 1 \\
 0 & 0 & 0 & 0 & 5/89 & 8/89 & -6/89 & 13/89 \\
 0 & 0 & 0 & 0 & 132/89 & 51/89 & -16/89 & 5/89 \\
 0 & 0 & 0 & 0 & 22/89 & -36/89 & 27/89 & -14/89 \\
 0 & 0 & 0 & 0 & 1 & -34 & -19 & -33
 \end{array}
 \end{array}$$

$$B^{-1} = \begin{bmatrix} 2 & 1 & 2 & -5 \\ 51 & 28 & 49 & -132 \\ 8 & 5 & 8 & -22 \\ -34 & -19 & -33 & 89 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & -3 & 0 & -2 \\ 3 & -12 & -2 & -6 \\ -2 & 10 & 2 & 5 \\ -1 & 6 & 1 & 3 \end{bmatrix}$$

$$\begin{array}{c}
 \begin{array}{c} \textcircled{1} \quad \textcircled{2} \quad \textcircled{-3} \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \begin{array}{c} \rightarrow \\ + \end{array} \\
 \begin{array}{cccc|cccc}
 1 & -3 & 0 & -2 & 1 & 0 & 0 & 0 \\
 3 & -12 & -2 & -6 & 0 & 1 & 0 & 0 \\
 -2 & 10 & 2 & 5 & 0 & 0 & 1 & 0 \\
 -1 & 6 & 1 & 3 & 0 & 0 & 0 & 1 \\
 1 & -3 & 0 & -2 & 1 & 0 & 0 & 0 \\
 0 & -3 & -2 & 0 & -3 & 1 & 0 & 0 \\
 0 & 4 & 2 & 1 & 2 & 0 & 1 & 0 \\
 0 & 3 & 1 & 1 & 1 & 0 & 0 & 1
 \end{array}
 \end{array}$$

Diagram 1:

```

      +
      |
      v
  (-3) (-4) (3)
      |   |   |
      +---+---+
      |   |   |
      +---+---+
      |   |   |
      +---+---+
    
```

Diagram 2:

```

      +
      |
      v
  (-2) (1) (-2/3)
      |   |   |
      +---+---+
      |   |   |
      +---+---+
      |   |   |
      +---+---+
    
```

Diagram 3:

```

      +
      |
      v
  (-1) (3/2)
      |   |
      +---+
      |   |
      +---+
    
```

1	-3	0	-2	1	0	0	0
0	1	2/3	0	1	-1/3	0	0
0	4	2	1	2	0	1	0
0	3	1	1	1	0	0	1
1	0	2	-2	4	-1	0	0
0	1	2/3	0	1	-1/3	0	0
0	0	-2/3	1	-2	4/3	1	0
0	0	-1	1	-2	1	0	1
1	0	2	-2	4	-1	0	0
0	1	2/3	0	1	-1/3	0	0
0	0	1	-3/2	3	-2	-3/2	0
0	0	-1	1	-2	1	0	1
1	0	0	1	-2	3	3	0
0	1	0	1	-1	1	1	0
0	0	1	-3/2	3	-2	-3/2	0
0	0	0	-1/2	1	-1	-3/2	1
1	0	0	1	-2	3	3	0
0	1	0	1	-1	1	1	0
0	0	1	-3/2	3	-2	-3/2	0
0	0	0	1	-2	2	3	-2
1	0	0	0	0	1	0	2
0	1	0	0	1	-1	-2	2
0	0	1	0	0	1	3	-3
0	0	0	1	-2	2	3	-2

$$C^{-1} = \begin{bmatrix} 0 & 1 & 0 & 2 \\ 1 & -1 & -2 & 2 \\ 0 & 1 & 3 & -3 \\ -2 & 2 & 3 & -2 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 3 & 5 & 8 & 3 \\ 2 & 1 & 4 & -3 \\ 4 & 6 & 12 & 6 \end{bmatrix}$$

Diagram 4:

```

      +
      |
      v
  (-4) (-2) (-3)
      |   |   |
      +---+---+
      |   |   |
      +---+---+
      |   |   |
      +---+---+
    
```

Diagram 5:

```

      +
      |
      v
  (-1)
      |
      +---+
      |   |
      +---+
    
```

1	2	3	2	1	0	0	0
3	5	8	3	0	1	0	0
2	1	4	-3	0	0	1	0
4	6	12	6	0	0	0	1
1	2	3	2	1	0	0	0
0	-1	-1	-3	-3	1	0	0
0	-3	-2	-7	-2	0	1	0
0	-2	0	-2	-4	0	0	1

$$\begin{array}{c}
 + \rightarrow \\
 \begin{array}{c}
 (-2) \quad (2) \quad (3) \\
 + \rightarrow \\
 + \rightarrow \\
 (-1) \quad (-2) \\
 + \rightarrow
 \end{array}
 \end{array}
 \begin{array}{cccc|cccc}
 1 & 2 & 3 & 2 & 1 & 0 & 0 & 0 \\
 0 & 1 & 1 & 3 & 3 & -1 & 0 & 0 \\
 0 & -3 & -2 & -7 & -2 & 0 & 1 & 0 \\
 0 & -2 & 0 & -2 & -4 & 0 & 0 & 1 \\
 1 & 0 & 1 & -4 & -5 & 2 & 0 & 0 \\
 0 & 1 & 1 & 3 & 3 & -1 & 0 & 0 \\
 0 & 0 & 1 & 2 & 7 & -3 & 1 & 0 \\
 0 & 0 & 2 & 4 & 2 & -2 & 0 & 1 \\
 1 & 0 & 0 & -6 & -12 & 5 & -1 & 0 \\
 0 & 1 & 0 & 1 & -4 & 2 & -1 & 0 \\
 0 & 0 & 1 & 2 & 7 & -3 & 1 & 0 \\
 0 & 0 & 0 & 0 & -12 & 4 & -2 & 1
 \end{array}$$

$0^{-1} = \neq$ No existe su inversa

2= Mediante el método de la ecuación $(A \times A^{-1} = I)$, determinar la inversa de las siguientes matrices.

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a+2c & b+2d \\ 3a+5c & 3b+5d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{array}{l}
 (-3) \times 1) \begin{cases} a+2c = 1 \\ 3a+5c = 0 \end{cases} \quad 3) \begin{cases} b+2d = 0 \\ 3b+5d = 1 \end{cases} \\
 2) \begin{cases} 3a+5c = 0 \\ -3a-6c = -3 \end{cases} \quad 4) \begin{cases} 3b+5d = 1 \\ -3b-6d = 0 \end{cases} \\
 \hline
 2a+5c = 0 \\
 -c = -3 (-) \\
 \boxed{c = 3}
 \end{array}$$

R/v de "c" en ①

$$\begin{array}{l}
 a+2c = 1 \\
 a+2 \cdot (3) = 1 \\
 a+6 = 1 \\
 \boxed{a = -5}
 \end{array}$$

R/v de "d" en ③

$$\begin{array}{l}
 b+2d = 0 \\
 b+2 \cdot (-1) = 0 \\
 b-2 = 0 \\
 \boxed{b = 2}
 \end{array}$$

$$A^{-1} = \begin{bmatrix} -5 & 2 \\ 3 & -1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a+2c & b+2d \\ 4a+9c & 4b+9d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} (-4) \times ① \quad \begin{cases} a+2c=1 \\ 4a+9c=0 \end{cases} \quad ③ \quad \begin{cases} b+2d=0 \\ 4b+9d=1 \end{cases} \quad (-4) \\ ② \quad \begin{cases} a+2c=1 \\ 4a+9c=0 \end{cases} \quad ④ \quad \begin{cases} b+2d=0 \\ 4b+9d=1 \end{cases} \\ \hline -4a-8c=-4 \quad -4b-8d=0 \\ 4a+9c=0 \quad 4b+9d=1 \\ \hline c=-4 \quad d=1 \end{array}$$

R/v de "c" en ①

$$\begin{aligned} a+2(-4) &= 1 \\ a-8 &= 1 \\ \hline a &= 9 \end{aligned}$$

R/v de "d" en ③

$$\begin{aligned} b+2d &= 0 \\ b+2(1) &= 0 \\ b+2 &= 0 \\ \hline b &= -2 \end{aligned}$$

$$B^{-1} = \begin{bmatrix} 9 & -2 \\ -4 & 1 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a+2c & b+2d \\ 3a+6c & 3b+6d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} (-3) \times ① \quad \begin{cases} a+2c=1 \\ 3a+6c=0 \end{cases} \quad ③ \quad \begin{cases} b+2d=0 \\ 3b+6d=1 \end{cases} \quad (-3) \\ ② \quad \begin{cases} a+2c=1 \\ 3a+6c=0 \end{cases} \quad ④ \quad \begin{cases} b+2d=0 \\ 3b+6d=1 \end{cases} \\ \hline -3a-6c=-3 \quad -3b-6d=0 \\ 3a+6c=0 \quad 3b+6d=1 \\ \hline 0=-3 \quad 0=1 \end{array}$$

C^{-1} = No existe su inversa

$$D = \begin{bmatrix} 1 & 3 \\ 2 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 \\ 2 & 8 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a+3c & b+3d \\ 2a+8c & 2b+8d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$-2 \times (1) \begin{cases} a+3c=1 \\ 2a+8c=0 \end{cases}$$

$$(2) \begin{cases} 2a+8c=0 \\ -2a-6c=-2 \end{cases}$$

$$-2a-6c=-2$$

$$2a+8c=0$$

$$-2c=-2$$

$$\boxed{c=-1}$$

R/v de "c" en (1)

$$a+3c=1$$

$$a+3(-1)=1$$

$$a-3=1$$

$$\boxed{a=4}$$

$$(3) \begin{cases} b+3d=0 \\ 2b+8d=1 \end{cases} \quad (-2)$$

$$(4) \begin{cases} 2b+8d=1 \\ -2b-6d=0 \end{cases}$$

$$-2b-6d=0$$

$$2b+8d=1$$

$$2d=1$$

$$\boxed{d=\frac{1}{2}}$$

R/v de "d" en (3)

$$b+3d=0$$

$$b+3(\frac{1}{2})=0$$

$$b+\frac{3}{2}=0$$

$$\boxed{b=-\frac{3}{2}}$$

$$D^{-1} = \begin{bmatrix} 4 & -3/2 \\ -1 & 1/2 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 9 & 3 \\ 7 & 2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 & 1 \\ 2 & 9 & 3 \\ 7 & 2 & 1 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{matrix} (1) & a+3d+g & (4) & b+3e+h & (7) & c+3f+i \\ (2) & 2a+9d+3g & (5) & 2b+9e+3h & (8) & 2c+9f+3i \\ (3) & 7a+2d+g & (6) & 7b+2e+h & (9) & 7c+2f+i \end{matrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$(-2) \times (1) \begin{cases} a+3d+g=1 \\ 2a+9d+3g=0 \end{cases}$$

$$(2) \begin{cases} 2a+9d+3g=0 \\ -2a-6d-2g=-2 \end{cases}$$

$$-2a-6d-2g=-2$$

$$2a+9d+3g=0$$

$$3d+g=-2 \quad (10)$$

$$(-2) \times (4) \begin{cases} b+3e+h=0 \\ 2b+9e+3h=1 \end{cases}$$

$$(4) \begin{cases} 2b+9e+3h=1 \\ -2b-6e-2h=0 \end{cases}$$

$$-2b-6e-2h=0$$

$$2b+9e+3h=1$$

$$3e+h=1 \quad (11)$$

$$(-2) \times (7) \begin{cases} c+3f+i=0 \\ 2c+9f+3i=0 \end{cases}$$

$$(6) \begin{cases} 2c+9f+3i=0 \\ -2c-6f-2i=0 \end{cases}$$

$$-2c-6f-2i=0$$

$$2c+9f+3i=0$$

$$3f+i=0 \quad (12)$$

$$\begin{aligned} & \textcircled{1} \begin{cases} a+3d+g=1 \\ 3d+g=-2 \end{cases} \\ & (-1) \textcircled{1} \begin{cases} a+3d+g=1 \\ -3d-g=2 \end{cases} \\ & \hline & \boxed{a=3} \end{aligned}$$

R/v de "a" en ② y ③

$$\begin{aligned} & 2(3)+9d+3g=0 \\ & 7(3)+2d+g=0 \\ & 6+9d+3g=0 \\ & 21+2d+g=0 \\ & \begin{cases} 9d+3g=-6 \\ 2d+g=-21 \end{cases} \\ & (-3) \begin{cases} 9d+3g=-6 \\ 2d+g=-21 \end{cases} \\ & \hline & \begin{cases} 9d+3g=-6 \\ -6d-3g=63 \end{cases} \\ & \hline & 3d=57 \\ & \boxed{d=19} \end{aligned}$$

R/v de "a y d" en ④

$$\begin{aligned} & 3+3(19)+g=1 \\ & 3+57+g=1 \\ & \boxed{g=-59} \end{aligned}$$

$$A^{-1} = \begin{bmatrix} 3 & -1 & 0 \\ 19 & -6 & -1 \\ -59 & 19 & 3 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 & 5 \\ 1 & 3 & 2 \\ 2 & 4 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 5 \\ 1 & 3 & 2 \\ 2 & 4 & 8 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{aligned} & \textcircled{1} \begin{cases} a+2d+5g \\ a+3d+2g \\ 2a+4d+8g \end{cases} \quad \textcircled{4} \begin{cases} b+2e+5h \\ b+3e+2h \\ 2b+4e+8h \end{cases} \quad \textcircled{7} \begin{cases} c+2f+5i \\ c+3f+2i \\ 2c+4f+8i \end{cases} \\ & \begin{bmatrix} \textcircled{1} & \textcircled{4} & \textcircled{7} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} & (-1) \textcircled{1} \begin{cases} a+2d+5g=1 \\ a+3d+2g=0 \end{cases} \\ & \hline & \begin{cases} a+2d+5g=1 \\ -a-2d-5g=-1 \end{cases} \\ & \hline & \begin{cases} a+2d+5g=1 \\ -a-2d-5g=-1 \end{cases} \\ & \hline & \begin{cases} a+3d+2g=0 \\ d-3g=-1 \end{cases} \end{aligned}$$

⑩

$$\begin{aligned} & (-1) \textcircled{4} \begin{cases} b+2e+5h=0 \\ b+3e+2h=1 \end{cases} \\ & \hline & \begin{cases} b+2e+5h=0 \\ -b-2e-5h=0 \end{cases} \\ & \hline & \begin{cases} b+3e+2h=1 \\ b+3e+2h=1 \end{cases} \\ & \hline & \begin{cases} b+3e+2h=1 \\ e-3h=1 \end{cases} \end{aligned}$$

⑪

$$\begin{aligned} & (-1) \textcircled{7} \begin{cases} c+2f+5i=0 \\ c+3f+2i=0 \end{cases} \\ & \hline & \begin{cases} c+2f+5i=0 \\ -c-2f-5i=0 \end{cases} \\ & \hline & \begin{cases} c+3f+2i=0 \\ c+3f+2i=0 \end{cases} \\ & \hline & \begin{cases} c+3f+2i=0 \\ f-3i=0 \end{cases} \end{aligned}$$

⑫

$$\begin{aligned} (-2) \textcircled{2} & \begin{cases} a+3d+2g=0 \\ \textcircled{3} \end{cases} \\ \textcircled{3} & \begin{cases} 2a+4d+8g=0 \\ -2a/-6d-4g=0 \\ 2a+4d+8g=0 \\ -2d+4g=0 \end{cases} \end{aligned}$$

$$\begin{aligned} (-2) \textcircled{6} & \begin{cases} b+3e+2h=1 \\ \textcircled{6} \end{cases} \\ \textcircled{6} & \begin{cases} 2b+4e+8h=0 \\ -2b/-6e-4h=-2 \\ 2b+4e+8h=0 \\ -2e+4h=-2 \end{cases} \end{aligned}$$

$$\begin{aligned} (-2) \textcircled{8} & \begin{cases} c+3f+2i=0 \\ \textcircled{4} \end{cases} \\ \textcircled{4} & \begin{cases} 2c+4f+8i=1 \\ -2c/-6f-4i=0 \\ 2c+4f+8i=1 \\ -2f+4i=1 \end{cases} \end{aligned}$$

$$\begin{aligned} (2) \textcircled{10} & \begin{cases} d-3g=-1 \\ \textcircled{13} \end{cases} \\ \textcircled{13} & \begin{cases} -2d+4g=0 \\ 2d/-6g=-2 \\ -2d+4g=0 \\ -2g=-2 \\ \boxed{g=1} \end{cases} \end{aligned}$$

$$\begin{aligned} (2) \textcircled{11} & \begin{cases} e-3h=1 \\ \textcircled{14} \end{cases} \\ \textcircled{14} & \begin{cases} -2e+4h=-2 \\ 2e/-6h=2 \\ -2e+4h=-2 \\ -2h=0 \\ \boxed{h=0} \end{cases} \end{aligned}$$

$$\begin{aligned} (2) \textcircled{12} & \begin{cases} f-3i=0 \\ \textcircled{15} \end{cases} \\ \textcircled{15} & \begin{cases} -2f+4i=1 \\ 2f/-6i=0 \\ -2f+4i=1 \\ -2i=1 \\ \boxed{i=-\frac{1}{2}} \end{cases} \end{aligned}$$

R/v de "g" en $\textcircled{13}$

$$\begin{aligned} -2d+4(1) &= 0 \\ -2d+4 &= 0 \\ -2d &= -4 \\ \boxed{d=2} \end{aligned}$$

R/v de "h" en $\textcircled{14}$

$$\begin{aligned} -2e+4(0) &= -2 \\ -2e+0 &= -2 \\ -2e &= -2 \\ \boxed{e=1} \end{aligned}$$

R/v de "i" en $\textcircled{15}$

$$\begin{aligned} -2f+4(-\frac{1}{2}) &= 1 \\ -2f-2 &= 1 \\ -2f &= 3 \\ \boxed{f=-\frac{3}{2}} \end{aligned}$$

R/v de "g y d" en $\textcircled{1}$

$$\begin{aligned} a+2(2)+5(1) &= 1 \\ a+4+5 &= 1 \\ \boxed{a=-8} \end{aligned}$$

R/v de "h y e" en $\textcircled{4}$

$$\begin{aligned} b+2(1)+5(0) &= 0 \\ b+2+0 &= 0 \\ \boxed{b=-2} \end{aligned}$$

R/v de "i y f" en $\textcircled{7}$

$$\begin{aligned} c+2(-\frac{3}{2})+5(-\frac{1}{2}) &= 0 \\ c-3-5/2 &= 0 \\ c-11/2 &= 0 \\ \boxed{c=11/2} \end{aligned}$$

$$B^{-1} = \begin{bmatrix} -8 & -2 & 11/2 \\ 2 & 1 & -3/2 \\ 1 & 0 & -1/2 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 1 & 3 \\ 2 & 3 & 2 \\ 5 & 7 & 5 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 & 3 \\ 2 & 3 & 2 \\ 5 & 7 & 5 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} ① & 2a+d+3g \\ ② & 2a+3d+2g \\ ③ & 5a+7d+5g \end{bmatrix} \begin{bmatrix} ④ & 2b+e+3h \\ ⑤ & 2b+3e+2h \\ ⑥ & 5b+7e+5h \end{bmatrix} \begin{bmatrix} ⑦ & 2c+f+3i \\ ⑧ & 2c+3f+2i \\ ⑨ & 5c+7f+5i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{aligned} (-) ① & \begin{cases} 2a+d+3g = 1 \\ 2a+3d+2g = 0 \\ -2a-d-3g = -1 \\ 2a+3d+2g = 0 \\ 2d-g = -1 \end{cases} \quad (10) \end{aligned}$$

$$\begin{aligned} (-) ④ & \begin{cases} 2b+e+3h = 0 \\ 2b+3e+2h = 1 \\ -2b-e-3h = 0 \\ 2b+3e+2h = 1 \\ 2e-h = 1 \end{cases} \quad (11) \end{aligned}$$

$$\begin{aligned} (-) ⑦ & \begin{cases} 2c+f+3i = 0 \\ 2c+3f+2i = 0 \\ -2c-f-3i = 0 \\ 2c+3f+2i = 0 \\ 2f-i = 0 \end{cases} \quad (12) \end{aligned}$$

$$\begin{aligned} (-s) ② & \begin{cases} 2a+3d+2g = 0 \\ 5a+7d+5g = 0 \end{cases} \\ (2) ③ & \begin{cases} 2a+3d+2g = 0 \\ 5a+7d+5g = 0 \end{cases} \\ -10a-15d-10g & = 0 \\ 10a+14d+10g & = 0 \\ -d & = 0 \\ \boxed{d = 0} \end{aligned}$$

$$\begin{aligned} (-s) ⑤ & \begin{cases} 2b+3e+2h = 1 \\ 5b+7e+5h = 0 \end{cases} \\ (2) ⑥ & \begin{cases} 2b+3e+2h = 1 \\ 5b+7e+5h = 0 \end{cases} \\ -10b-15e-10h & = -5 \\ 10b+14e+10h & = 0 \\ -e & = -5 \\ \boxed{e = 5} \end{aligned}$$

$$\begin{aligned} (-s) ⑧ & \begin{cases} 2c+3f+2i = 0 \\ 5c+7f+5i = 1 \end{cases} \\ (2) ⑨ & \begin{cases} 2c+3f+2i = 0 \\ 5c+7f+5i = 1 \end{cases} \\ -10c-15f-10i & = 0 \\ 10c+14f+10i & = 2 \\ -f & = 2 \\ \boxed{f = -2} \end{aligned}$$

R/v de "d" en (10)

$$\begin{aligned} 2(0)-g & = -1 \\ 0-g & = -1 \quad (-) \\ \boxed{g = 1} \end{aligned}$$

R/v de "e" en (11)

$$\begin{aligned} 2(5)-h & = 1 \\ 10-h & = 1 \\ -h & = -9 \quad (-) \\ \boxed{h = 9} \end{aligned}$$

R/v de "f" en (12)

$$\begin{aligned} 2(-2)-i & = 0 \\ -4-i & = 0 \\ \boxed{i = -4} \end{aligned}$$

R/v de "a" y "g" en (1)

$$\begin{aligned} 2a+0+3(1) & = 1 \\ 2a+0+3 & = 1 \\ 2a & = -2 \\ \boxed{a = -1} \end{aligned}$$

R/v de "b" y "h" en (4)

$$\begin{aligned} 2b+5+3(9) & = 0 \\ 2b+5+27 & = 0 \\ 2b & = -32 \\ \boxed{b = -16} \end{aligned}$$

R/v de "c" y "i" en (7)

$$\begin{aligned} 2c+(-2)+3(-4) & = 0 \\ 2c-2-12 & = 0 \\ 2c-14 & = 0 \\ 2c & = 14 \\ \boxed{c = 7} \end{aligned}$$

$$C^{-1} = \begin{bmatrix} -1 & -16 & 7 \\ 0 & 5 & -2 \\ 1 & 9 & -4 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 5 & 8 \\ 4 & 6 & 9 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 4 \\ 3 & 5 & 8 \\ 4 & 6 & 9 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} \textcircled{1} \begin{bmatrix} a+2d+4g \\ 3a+5d+8g \\ 4a+6d+9g \end{bmatrix} \quad \textcircled{4} \begin{bmatrix} b+2e+4h \\ 3b+5e+8h \\ 4b+6e+9h \end{bmatrix} \quad \textcircled{7} \begin{bmatrix} c+2f+4i \\ 3c+5f+8i \\ 4c+6f+9i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

$$\begin{array}{l} (-3) \textcircled{1} \begin{cases} a+2d+4g=1 \\ 3a+5d+8g=0 \end{cases} \\ -3a-6d-12g=-3 \\ \underline{3a+5d+8g=0} \\ -d-4g=-3 \quad \textcircled{10} \end{array}$$

$$\begin{array}{l} (-3) \textcircled{4} \begin{cases} b+2e+4h=0 \\ 3b+5e+8h=1 \end{cases} \\ -3b-6e-12h=0 \\ \underline{3b+5e+8h=1} \\ -e-4h=1 \quad \textcircled{11} \end{array}$$

$$\begin{array}{l} (-3) \textcircled{7} \begin{cases} c+2f+4i=0 \\ 3c+5f+8i=0 \end{cases} \\ -3c-6f-12i=0 \\ \underline{3c+5f+8i=0} \\ -f-4i=0 \quad \textcircled{12} \end{array}$$

$$\begin{array}{l} (-4) \textcircled{2} \begin{cases} 3a+5d+8g=0 \\ 4a+6d+9g=0 \end{cases} \\ -12a-20d-32g=0 \\ \underline{12a+18d+27g=0} \\ -2d-5g=0 \quad \textcircled{13} \end{array}$$

$$\begin{array}{l} (-4) \textcircled{5} \begin{cases} 3b+5e+8h=1 \\ 4b+6e+9h=0 \end{cases} \\ -12b-20e-32h=-4 \\ \underline{12b+18e+27h=0} \\ -2e-5h=-4 \quad \textcircled{14} \end{array}$$

$$\begin{array}{l} (-4) \textcircled{8} \begin{cases} 3c+5f+8i=0 \\ 4c+6f+9i=1 \end{cases} \\ -12c-20f-32i=0 \\ \underline{12c+18f+27i=3} \\ -2f-5i=3 \quad \textcircled{15} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{10} \begin{cases} -d-4g=-3 \\ -2d-5g=0 \end{cases} \\ \underline{2d+8g=6} \\ -2d-5g=0 \\ \underline{3g=6} \\ \boxed{g=2} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{11} \begin{cases} -e-4h=1 \\ -2e-5h=-4 \end{cases} \\ \underline{2e+8h=-2} \\ -2e-5h=-4 \\ \underline{3h=-6} \\ \boxed{h=-2} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{12} \begin{cases} -f-4i=0 \\ -2f-5i=3 \end{cases} \\ \underline{2f+8i=0} \\ -2f-5i=3 \\ \underline{3i=3} \\ \boxed{i=1} \end{array}$$

R/v de "g" en (10)

$$\begin{array}{l} -d-4(2)=-3 \\ -d-8=-3 \\ -d=5 \quad (-) \\ \boxed{d=-5} \end{array}$$

R/v de "h" en (11)

$$\begin{array}{l} -e-4(-2)=1 \\ -e+8=1 \\ -e=-7 \quad (-) \\ \boxed{e=7} \end{array}$$

R/v de "i" en (12)

$$\begin{array}{l} -f-4(1)=0 \\ -f-4=0 \\ \boxed{f=-4} \end{array}$$

R/v de "a y d" en (1)

$$\begin{array}{l} a+2(-5)+4(2)=1 \\ a-10+8=1 \\ \underline{a=-3} \end{array}$$

R/v de "h y e" en (4)

$$\begin{array}{l} b+2(7)+4(-2)=0 \\ b+14-8=0 \\ \underline{b=-6} \end{array}$$

R/v de "i y f" en (7)

$$\begin{array}{l} c+2(-4)+4(1)=0 \\ c-8+4=0 \\ \underline{c=4} \end{array}$$

$$Q^{-1} = \begin{bmatrix} 3 & -6 & 4 \\ -5 & 7 & -4 \\ 2 & -2 & 1 \end{bmatrix}$$

$$E = \begin{bmatrix} 1 & -2 & 0 \\ 2 & -3 & 1 \\ 1 & 1 & 5 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -2 & 0 \\ 2 & -3 & 1 \\ 1 & 1 & 5 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} \textcircled{1} \begin{bmatrix} a-2d & b-2e & c-2f \\ 2a-3d+g & 2b-3e+h & 2c-3f+i \\ a+d+5g & b+e+5h & c+f+5i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{1} \begin{cases} a-2d = 1 \\ 2a-3d+g = 0 \\ -2a+4d = -2 \\ 2a-3d+g = 0 \\ d+g = -2 \end{cases} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{2} \begin{cases} b-2e = 0 \\ 2b-3e+h = 1 \\ -2b+4e = 0 \\ 2b-3e+h = 1 \\ e+h = 1 \end{cases} \end{array}$$

$$\begin{array}{l} (-2) \textcircled{3} \begin{cases} c-2f = 0 \\ 2c-3f+i = 0 \\ -2c+4f = 0 \\ 2c-3f+i = 0 \\ f+i = 0 \end{cases} \end{array}$$

$$\begin{array}{l} \textcircled{2} \begin{cases} 2a-3d+g = 0 \\ a+d+5g = 0 \\ 2a-3d+g = 0 \\ -2a-2d-10g = 0 \\ -5d-9g = 0 \end{cases} \end{array}$$

$$\begin{array}{l} \textcircled{5} \begin{cases} 2b-3e+h = 1 \\ b+e+5h = 0 \\ 2b-3e+h = 1 \\ -2b-2e-10h = 0 \\ -5e-9h = 1 \end{cases} \end{array}$$

$$\begin{array}{l} \textcircled{8} \begin{cases} 2c-3f+i = 0 \\ c+f+5i = 1 \\ 2c-3f+i = 0 \\ -2c-2f-10i = -2 \\ -5f-9i = -2 \end{cases} \end{array}$$

$$\begin{array}{l} (5) \textcircled{10} \begin{cases} d+g = -2 \\ -5d-9g = 0 \\ 5d+5g = -10 \\ -5d-9g = 0 \\ -4g = -10 \\ g = \frac{5}{2} \end{cases} \end{array}$$

$$\begin{array}{l} (5) \textcircled{11} \begin{cases} e+h = 1 \\ -5e-9h = 1 \\ 5e+5h = 5 \\ -5e-9h = 1 \\ -4h = 6 \\ h = -\frac{3}{2} \end{cases} \end{array}$$

$$\begin{array}{l} (5) \textcircled{12} \begin{cases} f+i = 0 \\ -5f-9i = -2 \\ 5f+5i = 0 \\ -5f-9i = -2 \\ -4i = -2 \\ i = \frac{1}{2} \end{cases} \end{array}$$

R/u de "g" en $\textcircled{10}$

$$\begin{array}{l} d + \frac{5}{2} = -2 \\ d = -\frac{9}{2} \end{array}$$

R/u de "g" en $\textcircled{1}$

$$\begin{array}{l} a - 2(-\frac{9}{2}) = 1 \\ a + 9 = 1 \\ a = -8 \end{array}$$

R/u de "h" en $\textcircled{11}$

$$\begin{array}{l} e + (-\frac{3}{2}) = 1 \\ e = \frac{5}{2} \end{array}$$

R/u de "e" en $\textcircled{4}$

$$\begin{array}{l} b - 2(\frac{5}{2}) = 0 \\ b - 5 = 0 \\ b = 5 \end{array}$$

R/u de "i" en $\textcircled{12}$

$$\begin{array}{l} f + \frac{1}{2} = 0 \\ f = -\frac{1}{2} \end{array}$$

R/u de "f" en $\textcircled{7}$

$$\begin{array}{l} c - 2(-\frac{1}{2}) = 0 \\ c + 1 = 0 \\ c = -1 \end{array}$$

$$E^{-1} = \begin{bmatrix} -8 & 5 & -1 \\ -9/2 & 5/2 & -1/2 \\ 5/2 & -3/2 & 1/2 \end{bmatrix}$$

$$F = \begin{bmatrix} 2 & 1 & -1 \\ 5 & 2 & -3 \\ 0 & 2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 & -1 \\ 5 & 2 & -3 \\ 0 & 2 & 1 \end{bmatrix} \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} \textcircled{1} \begin{cases} 2a+d-g \\ 5a+2d-3g \\ 2d+g \end{cases} \quad \textcircled{4} \begin{cases} 2b+e-h \\ 5b+2e-3h \\ 2e+h \end{cases} \quad \textcircled{7} \begin{cases} 2c+f-i \\ 5c+2f-3i \\ 2f+i \end{cases} \end{array} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{l} (-2) \textcircled{1} \begin{cases} 2a+d-g=1 \\ 5a+2d-3g=0 \\ -4a-2d+2g=-2 \\ 5a+2d-3g=0 \\ a-g=-2 \end{cases} \end{array} \quad (10)$$

$$\begin{array}{l} (-2) \textcircled{4} \begin{cases} 2b+e-h=0 \\ 5b+2e-3h=1 \\ -4b-2e+2h=0 \\ 5b+2e-3h=1 \\ b-h=1 \end{cases} \end{array} \quad (11)$$

$$\begin{array}{l} (-2) \textcircled{7} \begin{cases} 2c+f-i=0 \\ 5c+2f-3i=0 \\ -4c-2f+2i=0 \\ 5c+2f-3i=0 \\ c-i=0 \end{cases} \end{array} \quad (12)$$

$$\begin{array}{l} (-1) \textcircled{3} \begin{cases} 5a+2d-3g=0 \\ 2d+g=0 \\ 5a+2d-3g=0 \\ -2d-g=0 \\ 5a-4g=0 \end{cases} \end{array} \quad (13)$$

$$\begin{array}{l} (-1) \textcircled{6} \begin{cases} 5b+2e-3h=1 \\ 2e+h=0 \\ 5b+2e-3h=1 \\ -2e-h=0 \\ 5b-4h=1 \end{cases} \end{array} \quad (14)$$

$$\begin{array}{l} (-1) \textcircled{9} \begin{cases} 5c+2f-3i=0 \\ 2f+i=1 \\ 5c+2f-3i=0 \\ -2f-i=-1 \\ 5c-4i=-1 \end{cases} \end{array} \quad (15)$$

$$\begin{array}{l} (-5) \textcircled{13} \begin{cases} a-g=-2 \\ 5a+4g=0 \\ -5g+5g=10 \\ 5a-4g=0 \\ g=10 \end{cases} \end{array}$$

$$\begin{array}{l} (-5) \textcircled{14} \begin{cases} b-h=1 \\ 5b-4h=1 \\ -5b+5h=-5 \\ 5b-4h=1 \\ h=-4 \end{cases} \end{array}$$

$$\begin{array}{l} (-5) \textcircled{15} \begin{cases} c-i=0 \\ 5c-4i=-1 \\ -5c+5i=0 \\ 5c-4i=-1 \\ i=-1 \end{cases} \end{array}$$

R/u de "g" en (10)

$$\begin{array}{l} a-(10)=-2 \\ a=8 \end{array}$$

R/u de "h" en (11)

$$\begin{array}{l} b-(-4)=1 \\ b+4=1 \\ b=-3 \end{array}$$

R/u de "i" en (12)

$$\begin{array}{l} c-(-1)=0 \\ c+1=0 \\ c=-1 \end{array}$$

R/v de "g y a" en ①

$$2(8) + d - (10) = 1$$

$$16 + d - 10 = 1$$

$$d + 6 = 1$$

$$\boxed{d = -5}$$

R/v de "h y b" en ④

$$2(+3) + e - (-4) = 0$$

$$-6 + e + 4 = 0$$

$$e - 2 = 0$$

$$\boxed{e = 2}$$

R/v de "i y c" en ⑦

$$2(-1) + f - (-1) = 0$$

$$-2 + f + 1 = 0$$

$$f - 1 = 0$$

$$\boxed{f = 1}$$

$$F^{-1} = \begin{bmatrix} 8 & -3 & -1 \\ -5 & 2 & 1 \\ 10 & -4 & -1 \end{bmatrix}$$

3- Mediante el método de G-J (Tipo II), determinar la inversa de las siguientes matrices.

$$A = \begin{bmatrix} 1 & -2 & -4 \\ -2 & -1 & 2 \\ 3 & 0 & -5 \end{bmatrix}$$

Pivot

①	-2	-4	1	0	0
-2	-1	2	0	1	0
3	0	-5	0	0	1
1	-2R ₁	-4	1	0	0
0	-5	-6	2	1	0
0	6	7	-3	0	1
1	0	-8/5	1/5	-2/5	0
0	1	-6/5	2/5	-1/5	0
0	0	-1/5	-3/5	6/5	1
1	0	0	5	-10	-8
0	1	0	-4	7	6
0	0	1	3	-6	-5

$$A^{-1} = \begin{bmatrix} 5 & -10 & -8 \\ -4 & 7 & 6 \\ 3 & -6 & -5 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 0 & 2 \\ 8 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$$

Piv

①	0	2	1	0	0
8	-1	3	0	1	0
4	1	8	0	0	1

1	0	Pivot 2	1	0	0
0	-1	-13	-8	1	0
0	1	0	-4	0	1
1	0	2	1	0	0
0	1	13	8	-1	0
0	0	(13)	-12	1	1
1	0	0	-11/13	2/13	2/13
0	1	0	-4	0	1
0	0	1	12/13	-1/13	-1/13

$$B = \begin{bmatrix} -11/13 & 2/13 & 2/13 \\ -4 & 0 & 1 \\ 12/13 & -1/13 & -1/13 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 1 \\ 1 & 2 & 3 \end{bmatrix}$$

		Pivot			
(1)	2	1	1	0	0
-1	0	1	0	1	0
1	2	3	0	0	1
1	2	1	1	0	0
0	(2)	2	1	1	0
0	0	2	-1	0	1
1	0	-1	0	-1	0
0	1	1	1/2	1/2	0
0	0	(2)	-1	0	1
1	0	0	-1/2	-1	1/2
0	1	0	1	1/2	-1/2
0	0	1	-1/2	0	1/2

$$C^{-1} = \begin{bmatrix} -1/2 & -1 & 1/2 \\ 1 & 1/2 & -1/2 \\ -1/2 & 0 & 1/2 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 2 & -4 \\ -1 & -1 & 5 \\ 2 & 7 & -3 \end{bmatrix}$$

		Pivot			
(1)	2	-4	1	0	0
-1	-1	5	0	1	0
2	7	-3	0	0	1

$$\begin{array}{ccc|ccc}
 1 & 2 & -4 & 1 & 0 & 0 \\
 0 & 1 & 1 & 1 & 1 & 0 \\
 0 & 3 & 5 & -2 & 0 & 1 \\
 1 & 0 & -6 & -1 & -2 & 0 \\
 0 & 1 & 1 & 1 & 1 & 0 \\
 0 & 0 & 2 & -5 & -3 & 1 \\
 1 & 0 & 0 & -16 & -11 & 3 \\
 0 & 1 & 0 & 7/2 & 5/2 & -1/2 \\
 0 & 0 & 1 & -2/5 & -3/2 & 1/2
 \end{array}$$

$$D^{-1} = \begin{bmatrix} -16 & -11 & 3 \\ 7/2 & 5/2 & -1/2 \\ -2/5 & -3/2 & 1/2 \end{bmatrix}$$

$$F = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 8 & -3 \\ 1 & 7 & 1 \end{bmatrix}$$

$$\begin{array}{ccc|ccc}
 \text{Pivot} & & & & & \\
 1 & 3 & -2 & 1 & 0 & 0 \\
 2 & 8 & -3 & 0 & 1 & 0 \\
 1 & 7 & 1 & 0 & 0 & 1 \\
 1 & 3 & -2 & 1 & 0 & 0 \\
 0 & 2 & 1 & -2 & 1 & 0 \\
 0 & 4 & 3 & -1 & 0 & 1 \\
 1 & 0 & -7/2 & 4 & -3/2 & 0 \\
 0 & 1 & 1/2 & -1 & 1/2 & 0 \\
 0 & 0 & 1 & 3 & -2 & 1 \\
 1 & 0 & 0 & 29/2 & -17/2 & 7/2 \\
 0 & 1 & 0 & -5/2 & 3/2 & -1/2 \\
 0 & 0 & 1 & 3 & -2 & 1
 \end{array}$$

$$F^{-1} = \begin{bmatrix} 29/2 & -17/2 & 7/2 \\ -5/2 & 3/2 & -1/2 \\ 3 & -2 & 1 \end{bmatrix}$$

4= Resolver las siguientes ecuaciones matriciales mediante propiedades

$$a) \begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix} X - \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix} X = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$$

$$\begin{matrix} A & X & B \\ \begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix} & X & = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \end{matrix}$$

$$AX = B \quad / A^{-1} \text{ derecha}$$

$$A^{-1}AX = A^{-1}B$$

$$Id X = A^{-1}B$$

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

$$A = \begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix} ; \quad A^{-1} = \frac{\begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix}}{9 - (-4 \cdot -2)} = \begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix}$$

$$X = \begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

$$X = \begin{bmatrix} -1 & 1 \\ 2 & 0 \end{bmatrix}$$

$$b) \begin{matrix} A & X & B \\ \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix} & X & = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 3 & 1 & 1 \end{bmatrix} \end{matrix}$$

$$AX = B \quad / A^{-1} \text{ derecha}$$

$$A^{-1}AX = A^{-1}B$$

$$Id X = A^{-1}B$$

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

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix}$$

Pivot					
①	-1	1	1	0	0
1	1	-1	0	1	0
-1	1	1	0	0	1
1	-1	1	1	0	0
0	②	-2	-1	1	0
0	0	2	1	0	1
1	0	0	1/2	1/2	0
0	1	-1	-1/2	1/2	0
0	0	②	1	0	1
1	0	0	1/2	1/2	0
0	1	0	0	1/2	1/2
0	0	1	1/2	0	1/2

$$A^{-1} = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 0 & 1/2 & 1/2 \\ 1/2 & 0 & 1/2 \end{bmatrix}$$

$$X = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 0 & 1/2 & 1/2 \\ 1/2 & 0 & 1/2 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 3 & 1 & 1 \end{bmatrix}$$

$$X = \begin{bmatrix} 1/2 & 3/2 & 5/2 \\ 3/2 & 1 & 3/2 \\ 2 & 3/2 & 2 \end{bmatrix}$$

$$c) \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} X - \begin{bmatrix} 6 & 0 & 1 \\ 2 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} 3 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 3 & -1 \end{bmatrix} + \begin{bmatrix} 6 & 0 & 1 \\ 2 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} 9 & 1 & 3 \\ 4 & 4 & 1 \\ 2 & 4 & -2 \end{bmatrix}$$

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

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

(1)	(1)	2	3	1	0	0
		0	1	0	1	0
		-1	0	0	0	1
+		1	2	1	0	0
(-2)		0	(1)	0	1	0
+		0	2	1	0	1
		1	0	1	-2	0
		0	1	0	1	0
		0	0	1	-2	1

$$A^{-1} = \text{no existe} \Rightarrow \text{por tanto } X = \text{no existe}$$

$$d) \begin{bmatrix} -1 & 0 & 3 \\ -8 & 7 & -1 \\ 3 & 4 & 2 \end{bmatrix} X = \begin{bmatrix} 1 & 0 & -3 \\ 4 & -1 & 6 \\ 5 & 2 & -1 \end{bmatrix}$$

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

$$A = \begin{bmatrix} -1 & 0 & 3 \\ -8 & 7 & -1 \\ 3 & 4 & 2 \end{bmatrix}$$

$$\begin{array}{l} (-1) \quad (-1) \quad 0 \quad 3 \quad 1 \quad 0 \quad 0 \\ -8 \quad 7 \quad -1 \quad 0 \quad 1 \quad 0 \\ 3 \quad 4 \quad 2 \quad 0 \quad 0 \quad 1 \\ (-3) \quad (8) \quad 1 \quad 0 \quad -3 \quad -1 \quad 0 \quad 0 \\ +L \rightarrow -8 \quad 7 \quad -1 \quad 0 \quad 1 \quad 0 \\ + \rightarrow 3 \quad 4 \quad 2 \quad 0 \quad 0 \quad 1 \\ 1 \quad 0 \quad -3 \quad -1 \quad 0 \quad 0 \\ (1/2) \quad 0 \quad 7 \quad -25 \quad -8 \quad 1 \quad 0 \\ 0 \quad 4 \quad 11 \quad 3 \quad 0 \quad 1 \\ 1 \quad 0 \quad -3 \quad -1 \quad 0 \quad 0 \\ (-4) \quad 0 \quad 1 \quad -25/7 \quad -8/7 \quad 1/7 \quad 0 \\ 0 \quad 4 \quad 11 \quad 3 \quad 0 \quad 1 \\ 1 \quad 0 \quad -3 \quad -1 \quad 0 \quad 0 \\ 0 \quad 1 \quad -25/7 \quad -8/7 \quad 1/7 \quad 0 \\ (7/177) \quad 0 \quad 0 \quad 177/7 \quad 53/7 \quad -4/7 \quad 1 \\ + \rightarrow 1 \quad 0 \quad -3 \quad -1 \quad 0 \quad 0 \\ + \rightarrow 0 \quad 1 \quad -25/7 \quad -8/7 \quad 1/7 \quad 0 \\ (3) \quad (25/7) \quad 0 \quad 0 \quad 1 \quad 53/177 \quad -4/177 \quad 7/177 \\ 1 \quad 0 \quad 0 \quad -6/59 \quad -4/59 \quad 7/59 \\ 0 \quad 1 \quad 0 \quad -13/177 \quad 11/177 \quad 25/177 \\ 0 \quad 0 \quad 1 \quad 53/177 \quad -4/177 \quad 7/177 \end{array}$$

$$A^{-1} = \begin{bmatrix} -6/59 & -4/59 & 7/59 \\ -13/177 & 11/177 & 25/177 \\ 53/177 & -4/177 & 7/177 \end{bmatrix}$$

$$X = \begin{bmatrix} -6/59 & -4/59 & 7/59 \\ -13/177 & 11/177 & 25/177 \\ 53/177 & -4/177 & 7/177 \end{bmatrix} \begin{bmatrix} 1 & 0 & -3 \\ 4 & -1 & 6 \\ 5 & 2 & -1 \end{bmatrix}$$

$$X = \begin{bmatrix} 13/59 & 18/59 & -13/59 \\ 52/59 & 13/59 & 80/177 \\ 24/59 & 6/59 & -190/177 \end{bmatrix}$$