

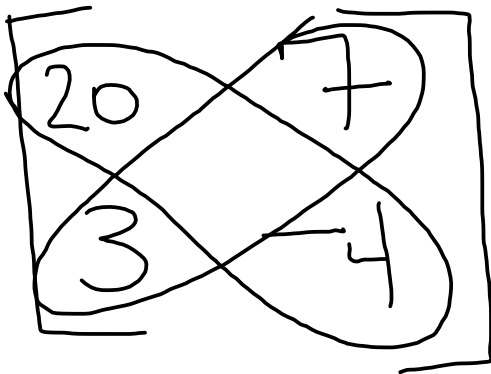
Warm-up

January 24, 2017

Find the determinant.

$$\textcircled{1} \det \left(\begin{bmatrix} 20 & ? \\ 3 & -4 \end{bmatrix} \right)$$

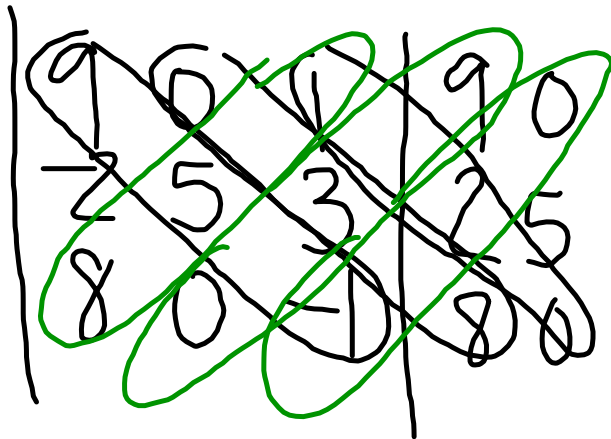
$$\textcircled{2} \begin{vmatrix} 9 & 0 & 1 \\ -2 & 5 & 3 \\ 8 & 0 & -1 \end{vmatrix}$$



$$20(-4) - 3(7)$$

$$-80 - 21$$

$$-101$$



$$(-45 + 0 + 0) - (40 + 0 + 0)$$

$$\begin{array}{r} -45 \\ -40 \\ \hline -85 \end{array}$$

$$\left(\begin{bmatrix} 20 & 7 \\ 3 & -4 \end{bmatrix} \right) \quad \begin{array}{l} 20(-4) - 3(7) \\ -80 \quad -21 \\ -101 \end{array}$$

$$\begin{array}{l} 9(5)(-1) + 0(3)(8) + 1(-2)(0) - \\ 8(5)(1) + 0(3)(9) + (-1)(-2)(0) \end{array}$$

$$-45 - 40$$

$$-85$$

$$\begin{array}{r|l}
 + & \begin{array}{c} 20 \\ 7 \end{array} \\
 - & \begin{array}{c} 3 \\ -4 \end{array}
 \end{array}
 \quad
 \begin{array}{l}
 20(-4) - 3(7) \\
 -80 - 21 \\
 \hline
 -101
 \end{array}$$

$$\begin{array}{r}
 2.(-45+0+0) - (40+0+0) \\
 -45 \quad - \quad 40
 \end{array}$$



$$\begin{array}{ccccc} 9 & 0 & 1 & 9 & 0 \\ -2 & 5 & 3 & -2 & 5 \\ 8 & 0 & -1 & 8 & 0 \end{array}$$

$$\begin{array}{r} -45 \\ +40 \\ \hline -85 \end{array} \quad (-45) - (40)$$

$$\textcircled{1} + \begin{bmatrix} 20 & 7 \\ 3 & -4 \end{bmatrix}$$

$$-80 - 21 = -10$$

$$\begin{pmatrix} - & + & - \\ - & - & - \end{pmatrix} - (40 + 0 + 0) \quad \checkmark$$

$$\underline{-45} + \underline{0} + \underline{0} - \underline{40} - \underline{0} - \underline{0}$$

$$(-45) - (40)$$

$$\textcircled{-85}$$

$$\underline{4}$$

yes,

$$\begin{array}{ccc|ccc} -3 & 0 & -2 & -3 & 0 \\ 2 & 8 & -3 & 2 & 8 \\ 0 & 0 & -1 & 0 & 0 \end{array}$$

$$(24 + 0 + 0) - (0 + 0 + 0)$$

24

$$\left| \begin{array}{cc} -2 & -3 \\ 0 & 6 \end{array} \right|$$

$$-2(6) - 0(-3)$$

$$-12 - 0$$

$$\underline{-12}$$

$$\begin{array}{ccc|c} 1 & 1 & 2 & \\ 1 & 1 & 2 & \end{array} = \begin{array}{c} 1(2) - 1(2) \\ 2 - 2 \\ 0 \end{array}$$

no
inverse

Determinants

$$\begin{array}{c} + \\ - \end{array} \left| \begin{array}{cc} a & b \\ c & d \end{array} \right| = ad - cb$$

$$\text{Inverse } \begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} \\ = \frac{1}{\det \begin{bmatrix} a & b \\ c & d \end{bmatrix}} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

① Determinant

②

$$\frac{1}{ad - cb} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

a & d switch
change sign of c & b.

①

$$\begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix}^{-1}$$

$$1. \quad \text{Det} = \begin{vmatrix} 1 & -4 \\ 4 & -7 \end{vmatrix} = \begin{matrix} 1(-7) - 4(-4) \\ \rightarrow +16 \\ 9 \end{matrix}$$

$$2. \quad \frac{1}{9} \begin{bmatrix} -7 & 4 \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} -7/9 & 4/9 \\ -4/9 & 1/9 \end{bmatrix}$$

$$\textcircled{6} \quad \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$$\textcircled{1} \text{ Det} = 16 - 7 = 9$$

$$\textcircled{2} \quad X = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$$X = \frac{1}{9} \begin{bmatrix} 27 & -45 \\ -36 & -18 \end{bmatrix}$$

$$X = \begin{bmatrix} 3 & -5 \\ -4 & -2 \end{bmatrix}$$

$$\begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$2 \times 2 \quad \checkmark \quad 2 \times 2$

2×2

$$\begin{bmatrix} -4(-40) + -7(19) & & \\ 160 & -133 & -45 \\ 27 & & \\ -36 & & -18 \end{bmatrix}$$

$$\textcircled{5} \begin{bmatrix} 5 & 7 \\ 0 & 0 \end{bmatrix} X = \begin{bmatrix} -8 \\ 0 \end{bmatrix}$$

Find inverse

$$\textcircled{1} \text{Det} = 0$$

no inverse

no solution

$$\textcircled{1} \quad \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix}^{-1}$$

$$\textcircled{1} \quad \left| \begin{array}{cc|c} 1 & -4 & \\ 4 & -7 & \end{array} \right| = \begin{array}{l} 1(-7) - 4(-16) \\ -7 + 64 \\ 57 \end{array}$$

$$\textcircled{2} \quad \frac{1}{57} \begin{bmatrix} -7 & 4 \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} -7/57 & 4/57 \\ -4/57 & 1/57 \end{bmatrix}$$

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

(1) $\begin{bmatrix} -1 & 0 \\ 7 & 8 \end{bmatrix}^{-1}$

1. $\begin{vmatrix} -1 & 0 \\ 7 & 8 \end{vmatrix} = -1(8) - 7(0) = -8$

2. $\frac{1}{-8} \begin{bmatrix} 8 & 0 \\ -7 & -1 \end{bmatrix}$

$\frac{1}{-8} \begin{bmatrix} 8 & 0 \\ -7 & -1 \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 7 & 8 \end{bmatrix}$

$\begin{matrix} 2 \times 2 & 2 \times 2 \\ \overline{R} & \overline{C} \end{matrix}$

$\frac{1}{-8} \begin{matrix} \overline{TL} & \overline{TR} \\ \overline{BL} & \overline{BR} \end{matrix}$

$8(-1) + 0(7)$ -8	$8(0) + 0(8)$ 0
$-7(-1) + -1(7)$ 0	$-7(0) + -1(8)$ -8

$$\begin{bmatrix} 1 & 0 & 0 \\ 8 & -1 & 0 \\ 0 & 0 & 8 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 8 & -1 & 0 \\ 0 & 0 & 8 \end{bmatrix}$$

Handwritten notes: A red arrow points to the top-right element '0'. A green circle highlights the bottom row. A red arrow points from the first column to the second column. A green arrow points from the second column to the third column.

$$\begin{array}{l} \text{BL} \\ \begin{array}{l} 8 \\ -1 \\ 0 \end{array} \end{array} \quad \begin{array}{l} \text{TR} \\ \begin{array}{l} 8(-1) + 0(0) \\ -8 \\ 0 \end{array} \end{array} \quad \begin{array}{l} \text{BR} \\ \begin{array}{l} 8(0) + 0(8) \\ 0 \\ -8 \end{array} \end{array}$$

Handwritten notes: The calculations are enclosed in a green box. The labels BL, TR, and BR are written in green.

$$\begin{bmatrix} 1 & 0 & 0 \\ 8 & -1 & 0 \\ 0 & 0 & 8 \end{bmatrix}$$

$$\frac{1}{-8} \begin{bmatrix} 8 & 0 \\ -7 & -1 \end{bmatrix} \begin{array}{c} | \\ \begin{bmatrix} -1 & 0 \\ 7 & 8 \end{bmatrix} \end{array}$$

$2 \times 2 \qquad \qquad \qquad 2 \times 2$

$$= \begin{array}{c} \text{TL} \\ \begin{array}{c} \begin{array}{cc} 8(-1) + 0(7) & 8(0) + 0(8) \\ -8 & 0 \end{array} \\ \begin{array}{cc} -7(-1) + -1(7) & -7(0) + -1(8) \\ 0 & -8 \end{array} \\ \text{BL} \end{array} \end{array} \begin{array}{c} \text{TR} \\ \begin{array}{c} \begin{array}{cc} -1 & 0 \\ 7 & 8 \end{array} \\ \text{BR} \end{array} \end{array}$$

$$\frac{1}{-8} \begin{bmatrix} -8 & 0 \\ 0 & -8 \end{bmatrix}$$

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

$$\textcircled{6} \begin{matrix} -1 \\ \textcircled{1} \end{matrix} \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \begin{matrix} -1 \\ \textcircled{1} \end{matrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

multiply by inverse

$$\textcircled{1} \text{ Det} = 9$$

$$-4(-4) = 16 \rightarrow$$

~~$$\frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$~~

$$\frac{1}{9} \begin{bmatrix} 27 & -45 \\ -36 & -18 \end{bmatrix}$$

$$X = \begin{bmatrix} 3 & -5 \\ -4 & -2 \end{bmatrix}$$

$$\begin{bmatrix} -4 & -7 \\ -1 & -9 \end{bmatrix} \begin{bmatrix} -40 & 8 \\ 19 & 3 \end{bmatrix}$$

$\frac{2 \times 2}{R} \quad \quad \quad \frac{2 \times 2}{C}$

TL

$$\begin{bmatrix} -4(-40) + -7(19) & -45 \\ 27 & -45 \\ -36 & -18 \end{bmatrix}$$

$$\textcircled{5} \begin{bmatrix} 5 & 7 \\ 0 & 0 \end{bmatrix} X = \begin{bmatrix} -8 \\ 0 \end{bmatrix}$$

Multiply by inverse.

$$\therefore \text{Det } \begin{vmatrix} 5 & 7 \\ 0 & 0 \end{vmatrix} = 5(0) - (07)$$

no inverse

no solution

$$\textcircled{2} \begin{bmatrix} 7 & 6 \\ 7 & 6 \end{bmatrix}^{-1}$$

$$1. \quad 7(6) - 7(6)$$
$$42 - 42$$

0

No inverse

$$\textcircled{1} \quad \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix}^{-1}$$

$$\textcircled{1} \quad \begin{array}{l} 1(-7) - 4(-4) \\ \rightarrow +16 \\ 9 \end{array}$$

$$\textcircled{2} \quad \frac{1}{9} \begin{bmatrix} -7 & 4 \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} -7/9 & 4/9 \\ -4/9 & 1/9 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad \underline{|A|} = 1(4) - 3(2)$$
$$= 4 - 6$$
$$= -2$$

$$A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$$

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

$$A \cdot A^{-1} = I$$

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

$$1(-2) + 2(3/2) = -2 + 3 = 1$$

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

$$3(-2) + 4(3/2) = -6 + 6 = 0$$

$$3(1) + 4(-1/2) = 3 - 2 = 1$$

$$\textcircled{5} \begin{bmatrix} 5 & 7 \\ 0 & 0 \end{bmatrix} \cancel{=} \begin{bmatrix} -8 \\ 0 \end{bmatrix}$$

Find inverse.

$$\textcircled{1} \text{ Det} = \begin{matrix} 5(0) - (47) \\ 0 - 0 \\ 0 \end{matrix}$$

No inverse

No solution

$$\textcircled{6} \quad -1 \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} \times = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

Find inverse.

$$1. \text{ Det} = -4(-4) - 1(7)$$

$$X^{-1} = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$-4(-40) + 7(19)$

$$X = \frac{1}{9} \begin{bmatrix} 27 & -45 \\ -36 & -18 \end{bmatrix} \begin{matrix} TR \\ BR \end{matrix}$$

$$X = \begin{bmatrix} 3 & -5 \\ -4 & -2 \end{bmatrix}$$

10

$$\begin{bmatrix} 1 & 5 \\ 0 & -5 \end{bmatrix} A - \begin{bmatrix} 6 \\ 2 \end{bmatrix} = \begin{bmatrix} 24 \\ -37 \end{bmatrix}$$

$$+ \begin{bmatrix} 6 \\ 2 \end{bmatrix} + \begin{bmatrix} 6 \\ 2 \end{bmatrix}$$

P
E
D
M
A
S

↑

inverse

~~$$\begin{bmatrix} 1 & 5 \\ 0 & -5 \end{bmatrix} A = \begin{bmatrix} 30 \\ -35 \end{bmatrix}$$~~

1. Determinant

$$1(-5) - 0(5)$$

$$-5 - 0$$

2.

$$A = \frac{1}{-5} \begin{bmatrix} -5 & -5 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 30 \\ -35 \end{bmatrix}$$

R → C ↓

2x2 √ 2x1

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

$$= \frac{1}{-5} \begin{bmatrix} -5(30) + -5(-35) \\ -150 + 175 \\ 25 \\ 0(30) + 1(-35) \\ -35 \end{bmatrix}$$

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

$$\textcircled{9} \begin{matrix} + \\ - \end{matrix} \begin{bmatrix} 2 & -6 \\ -1 & 3 \end{bmatrix} X = \begin{bmatrix} 10 & -18 \\ -5 & 9 \end{bmatrix}$$

Multiply by inverse

1. Determinant
 $2(3) - (-1)(-6)$
 $6 - 6$
 0

no inverse

no solution

$$\begin{bmatrix} 2 & 4 \\ -3 & 7 \end{bmatrix} + \begin{bmatrix} 6 \\ 2 \end{bmatrix} = \begin{bmatrix} \cdot \\ \cdot \end{bmatrix}$$

$$\textcircled{7} \begin{bmatrix} -1 & 0 \\ 5 & -5 \end{bmatrix} C = \begin{bmatrix} 8 & -2 \\ -10 & -25 \end{bmatrix}$$

Multiply by inverse

1. Determinant
 $-1(-5) - 5(0)$
 $5 - 0$

$$C^{-1} = \frac{1}{5} \begin{bmatrix} -5 & 0 \\ -5 & -1 \end{bmatrix} \begin{bmatrix} 8 & -2 \\ -10 & -25 \end{bmatrix}$$

2×2 2×2

$\frac{1}{5}$	TL	$-5(8) + 0(-10)$ $-40 + 0$ -40	$-5(-2) + 0(-25)$ $10 + 0$ 10
	BL	$-5(8) + -1(-10)$ $-40 + 10$ -30	$-5(-2) + -1(-25)$ $10 + 25$ 35

$$C = \begin{bmatrix} -8 & 2 \\ -6 & 7 \end{bmatrix}$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

Inverses

① Find determinant. $|A| = ad - bc$

② Plug into formula.

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

a and d switch

c and b change signs

$$1. \begin{matrix} 3B \\ (\frac{1}{3}) \end{matrix} = \begin{matrix} [33 & -6 & -18] \\ (\frac{1}{3}) \end{matrix}$$

$$B = [11 \quad -2 \quad -6]$$

$$3. \begin{matrix} [0 & 10 & -4] - X \\ -[0 & 10 & -4] \end{matrix} = \begin{matrix} [-4 & 2 & -8] \\ -[0 & 10 & -4] \end{matrix}$$

$$\begin{matrix} (-1) \\ (-1) \end{matrix} -X = [-4 \quad -8 \quad -4] \begin{matrix} (-1) \\ (-1) \end{matrix}$$

$$X = [4 \quad 8 \quad 4]$$

$$6. \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

① Find inverse

$$\det = (-4)(-4) - 7(1) = 16 - 7 = 9$$

$$\left(\begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} \right)^{-1} = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix}$$

~~$$\frac{1}{9} \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X$$~~

$$\frac{1}{9} \begin{bmatrix} 16-7 & -28+28 \\ 4-4 & -7+16 \\ \underline{9} & \underline{9} \end{bmatrix} X = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix} X$$

$$X = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \cdot \begin{bmatrix} -40 & 4 \\ 19 & 3 \end{bmatrix}$$

$$= \frac{1}{9} \begin{bmatrix} 27 & -415 \\ -36 & -18 \end{bmatrix}$$

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

$$\begin{array}{r} -4(-40) + -7(19) \\ 160 + -133 \\ \hline 27 \end{array}$$

$$\begin{array}{r} -4(6) + -7(3) \\ -24 + -21 \\ \hline -45 \end{array}$$

$$\begin{array}{r} -1(40) + -4(19) \\ 40 + -76 \\ \hline -36 \end{array}$$

$$\begin{array}{r} -1(6) + -4(3) \\ -6 + -12 \\ \hline -18 \end{array}$$

$$\textcircled{1} 3B = \begin{bmatrix} 33 & -6 & -18 \end{bmatrix}$$

$$\begin{matrix} 1^* \\ 3 \\ 3 \end{matrix} \begin{matrix} 1^* \\ 3 \\ 3 \end{matrix} \begin{bmatrix} 11 & -2 & -6 \end{bmatrix}$$

$$\textcircled{6} \begin{bmatrix} -4 & -7 \\ 1 & -4 \end{bmatrix} X = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

1. $\det: -4(-4) - 7(1) = 9$

2. $\frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix}$

$$\frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \cdot \begin{bmatrix} -4 & -7 \\ 1 & -4 \end{bmatrix}$$

$\begin{bmatrix} \times & \checkmark \\ \checkmark & \times \end{bmatrix}$

$$\begin{array}{l} \text{TL} \\ \text{BL} \end{array} \left[\begin{array}{cc} -4(-4) + -7(1) & -4(7) + -7(-4) \\ 16 - 7 & -28 + 28 \\ \underline{9} & \underline{0} \\ -1(-4) + -4(1) & -1(7) + -4(-4) \\ 4 - 4 & -7 + 16 \\ \underline{0} & \underline{9} \end{array} \right] \begin{array}{l} \text{TR} \\ \text{BR} \end{array}$$

$$\frac{1}{9} \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$X = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \cdot \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$$= \frac{1}{9} \begin{bmatrix} 27 & -45 \\ -36 & -18 \end{bmatrix}$$

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

$$A = \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix}$$

$$\textcircled{1} \quad 1(-7) - (-4)(4) \\ -7 - -16$$

$$\textcircled{2} \quad A^{-1} = \frac{1}{9} \begin{bmatrix} -7 & 4 \\ -4 & 1 \end{bmatrix}$$

$$\frac{1}{9} \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix} \quad \frac{1}{9} \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix}$$

$$\textcircled{1} \quad \cancel{\left(\frac{1}{3}\right)} B = \cancel{\left(\frac{1}{3}\right)} [33 \quad -6 \quad -18]$$

$$B = [11 \quad -2 \quad -6]$$

$$\textcircled{5} \quad \begin{bmatrix} 5 & 7 \\ 0 & 0 \end{bmatrix} X = \begin{bmatrix} -8 \\ 0 \end{bmatrix}$$

no solution

$$\textcircled{6} \quad \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix} X = \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

ORDER MATTERS!

IX

$$\cancel{IX} = \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} -40 & 6 \\ 19 & 3 \end{bmatrix}$$

$$\cancel{X} = \frac{1}{9} \begin{bmatrix} 27 & -45 \\ -36 & -18 \end{bmatrix} = \begin{bmatrix} 3 & -5 \\ -4 & -2 \end{bmatrix}$$

LEFT

$$\begin{pmatrix} 1 & 0 \\ 0 & 9 \end{pmatrix} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix} \cdot \begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix}$$

~~2x2~~ ✓ ~~2x2~~

	TL		TR
=	$\frac{1}{9}$	$-1(-4) + -7(1) \quad -4(7) + -7(-1)$ $16 - 7 \quad -28 + 28$ $\frac{9}{9} \quad 0$	
		$-1(-4) + -4(1) \quad -1(7) + -4(-1)$ $4 - 4 \quad -7 + 4$ $0 \quad -3$	BR
=	$\frac{1}{9}$	$0 \quad -3$	

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

① Find the inverse.

$$\begin{bmatrix} -4 & 7 \\ 1 & -4 \end{bmatrix}^{-1}$$

$$1. \det = \begin{matrix} -4(-4) & - & 1(7) \\ 16 & - & 7 \\ & 9 & \end{matrix}$$

$$2. \frac{1}{9} \begin{bmatrix} -4 & -7 \\ -1 & -4 \end{bmatrix}$$

⑧

$$\begin{bmatrix} 6 & 2 \\ -10 & -4 \end{bmatrix} B = \begin{bmatrix} -12 \\ 26 \end{bmatrix}$$

$$\downarrow$$

$$\begin{vmatrix} 6 & 2 \\ -10 & -4 \end{vmatrix} = 6(-4) - (-10)(2)$$

$$-24 + 20$$

$$-4$$

$$\frac{1}{-4} \begin{bmatrix} -4 & -2 \\ 10 & 6 \end{bmatrix} \quad \text{Find inverse.}$$

$$B = \frac{1}{-4} \begin{bmatrix} -4 & -2 \\ 10 & 6 \end{bmatrix} \begin{bmatrix} -12 \\ 26 \end{bmatrix}$$

$\begin{matrix} 2 \times 2 & 2 \times 1 \\ - & - \end{matrix}$

$$B = \frac{1}{-4} \begin{bmatrix} -4(-12) + -2(26) \\ -4 \\ 10(-12) + 6(26) \\ 36 \end{bmatrix} = \begin{bmatrix} 1 \\ -9 \end{bmatrix}$$

⑧ $\begin{bmatrix} 6 & 2 \\ -10 & -4 \end{bmatrix} B = \begin{bmatrix} -12 \\ 26 \end{bmatrix}$

1. $\begin{vmatrix} 6 & 2 \\ -10 & -4 \end{vmatrix} = 6(-4) - -10(2)$
 $-24 + 20$
 -4

2. $\frac{1}{-4} \begin{bmatrix} -4 & -2 \\ 10 & 6 \end{bmatrix}$

$B = \frac{1}{-4} \begin{bmatrix} -4 & -2 \\ 10 & 6 \end{bmatrix} \begin{bmatrix} -12 \\ 26 \end{bmatrix}$

$\rightarrow \begin{matrix} 2 \times 2 \checkmark 2 \times 1 \\ - \end{matrix} = \frac{1}{-4} \begin{bmatrix} -4(-12) + -2(26) \\ 10(-12) + 6(26) \\ - \end{bmatrix} = \frac{1}{-4} \begin{bmatrix} 1 \\ -9 \end{bmatrix}$

1. Find the inverse on the left side of the equation.

2. Multiply it on the right side of the equation.

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$\begin{bmatrix} -4(-12) + -2(26) \\ -4 \\ 10(-12) + 6(26) \\ 36 \\ - \end{bmatrix} = \begin{bmatrix} 1 \\ -9 \end{bmatrix}$

