Matrices

$$\begin{bmatrix} 2 & 3 & 1 \\ 4 & 6 & 8 \end{bmatrix}$$

Order

2 x 3

Rows x Columns

Add

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

A + B

$$\begin{bmatrix} 5 & -3 & -1 \\ -5 & 8 & 14 \end{bmatrix}$$

Multiply

Rows x Columns Rows x Columns

Same

Answer Order

2×2 $\quad\quad$ 2×3

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

$$\begin{array}{c} \\ R_1 \\ R_2 \end{array} \begin{array}{c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} \\ \begin{bmatrix} 3(-1)+1(-3) & 3(4)+1(5) & 3(-2)+1(-4) \\ 0(-1)+2(-3) & 0(4)+2(5) & 0(-2)+2(-4) \end{bmatrix} \end{array}$$

$$\begin{bmatrix} -6 & 17 & -10 \\ -6 & 10 & -8 \end{bmatrix}$$

Determinant

2 x 2

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad ad - bc$$

$$\begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix} \quad 4(3) - 2(-1)$$

$$12 + 2$$

$$14$$

Inverse

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

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

$$A^{-1} = \frac{1}{14}\begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} \frac{3}{14} & -\frac{1}{7} \\ \frac{1}{14} & \frac{2}{7} \end{bmatrix}$$

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$$x - 3z = -2$$
$$3x + y - 2z = 5$$
$$2x + 2y + z = 4$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 3 & 1 & -2 & 5 \\ 2 & 2 & 1 & 4 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & C_1 \\ 0 & 1 & 0 & C_2 \\ 0 & 0 & 1 & C_3 \end{array}\right]$$

1st 9th 8th
2nd 4th 7th
3rd 5th 6th

$R_1 \cdot -3 + R_2 \to R_2$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 2 & 2 & 1 & 4 \end{array}\right]$$

$R_1 \cdot -2 + R_3 \to R_3$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 2 & 7 & 8 \end{array}\right]$$

$R_2 \cdot -2 + R_3 \to R_3$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & -7 & -14 \end{array}\right]$$

$$\begin{array}{r} 22 \\ -8 \\ \hline \end{array}$$

$R_3 + R_2 \to R_2$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & -7 & -14 \end{array}\right]$$

$\frac{R_3}{-7} \to R_3$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 2 \end{array}\right]$$

$R_3 \cdot 3 + R_1 \to R_1$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 2 \end{array}\right]$$

$x = 4$
$y = -3$
$z = 2$

$(4, -3, 2)$