Matrix Inverse Examples

SOLVING EQUATIONS Solve the matrix equation.

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

$A \cdot X = B$

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

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

$$X = \begin{bmatrix} \frac{19}{6} & \frac{7}{6} \\ \frac{29}{12} & \frac{5}{12} \end{bmatrix}$$

FINDING INVERSES Use a graphing calculator to find the inverse of matrix A. Check the result by showing that $AA^{-1} = I$ and $A^{-1}A = I$.

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

$$A^{-1} = \begin{bmatrix} -\frac{3}{10} & -\frac{1}{5} & \frac{3}{10} \\ \frac{9}{10} & \frac{3}{5} & \frac{1}{10} \\ -\frac{1}{5} & \frac{1}{5} & \frac{1}{5} \end{bmatrix}$$

SYSTEMS OF TWO EQUATIONS Use an inverse matrix to solve the linear system.

$$4x + 7y = -16$$
$$2x + 3y = -4$$

$$\begin{bmatrix} 4 & 7 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -16 \\ -4 \end{bmatrix}$$

$A \cdot X = B$

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

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

$$X = \begin{bmatrix} 10 \\ -8 \end{bmatrix} \quad (10, -8)$$

SYSTEMS OF THREE EQUATIONS Use an inverse matrix and a graphing calculator to solve the linear system.

35. $x - y - 3z = 2$
$5x + 2y + z = -17$
$-3x - y = 8$

$$\begin{bmatrix} 1 & -1 & -3 \\ 5 & 2 & 1 \\ -3 & -1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -17 \\ 8 \end{bmatrix}$$

$A \cdot X = B$

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

$$\begin{bmatrix} -9 \\ 19 \\ -10 \end{bmatrix}$$

$(-9, 19, -10)$