GUIDED PRACTICE for Example 3

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

5. $A = \begin{bmatrix} 2 & -2 & 0 \\ 2 & 0 & -2 \\ 12 & -4 & -6 \end{bmatrix}$ **6.** $A = \begin{bmatrix} -3 & 4 & 5 \\ 1 & 5 & 0 \\ 5 & 2 & 2 \end{bmatrix}$ **7.** $A = \begin{bmatrix} 2 & 1 & -2 \\ 5 & 3 & 0 \\ 4 & 3 & 8 \end{bmatrix}$

KEY CONCEPT *For Your Notebook*

Using an Inverse Matrix to Solve a Linear System

STEP 1 **Write** the system as a matrix equation $AX = B$. The matrix A is the coefficient matrix, X is the **matrix of variables**, and B is the **matrix of constants**.

STEP 2 **Find** the inverse of matrix A.

STEP 3 **Multiply** each side of $AX = B$ by A^{-1} *on the left* to find the solution $X = A^{-1}B$.

EXAMPLE 4 Solve a linear system

Use an inverse matrix to solve the linear system.

$2x - 3y = 19$ Equation 1
$x + 4y = -7$ Equation 2

Solution

SOLVE SYSTEMS
You can use the method shown in Example 4 if A has an inverse. If A does not have an inverse, then the system has either no solution or infinitely many solutions.

STEP 1 **Write** the linear system as a matrix equation $AX = B$.

coefficient matrix (A) · matrix of variables (X) = matrix of constants (B)

$$\begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 19 \\ -7 \end{bmatrix}$$

STEP 2 **Find** the inverse of matrix A.

$$A^{-1} = \frac{1}{8 - (-3)} \begin{bmatrix} 4 & 3 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} \frac{4}{11} & \frac{3}{11} \\ -\frac{1}{11} & \frac{2}{11} \end{bmatrix}$$

STEP 3 **Multiply** the matrix of constants by A^{-1} on the left.

$$X = A^{-1}B = \begin{bmatrix} \frac{4}{11} & \frac{3}{11} \\ -\frac{1}{11} & \frac{2}{11} \end{bmatrix} \begin{bmatrix} 19 \\ -7 \end{bmatrix} = \begin{bmatrix} 5 \\ -3 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

▶ The solution of the system is $(5, -3)$.

CHECK $2(5) - 3(-3) = 10 + 9 = 19$ ✓ $5 + 4(-3) = 5 - 12 = -7$ ✓

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