

Solving Systems Using Inverse Matrices

In Lesson 4.3 you learned how to solve a system of linear equations using Cramer's rule. Here you will learn to solve a system using inverse matrices.

A linear system can be written as a matrix equation $AX = B$. The matrix A is the coefficient matrix of the system, X is the matrix of variables, and B is the matrix of constants.

Write the system of linear equations as a matrix equation.

$$\begin{aligned} -3x + 4y &= 5 \\ 2x - y &= -10 \end{aligned} \quad AX = B$$

$$A \quad X = B$$

$$\begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -10 \end{bmatrix}$$

Once you have written a linear system as $AX = B$, you can solve for X by multiplying each side of the matrix by A^{-1} on the left.

$$\begin{aligned} AX &= B \\ A^{-1}AX &= A^{-1}B \\ IX &= A^{-1}B \\ X &= A^{-1}B \end{aligned}$$

Let $AX = B$ represent a system of linear equations. If the determinant of A is nonzero, then the linear system has exactly one solution, which is $X = A^{-1}B$.

Use matrices to solve the linear system.

$$\begin{aligned} -2x - 5y &= -19 \\ 3x + 2y &= 1 \end{aligned} \quad (-3, 5)$$

$$A \quad X = B$$

$$\begin{bmatrix} -2 & -5 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -19 \\ 1 \end{bmatrix}$$

$$\begin{aligned} A^{-1} &= \frac{1}{\Delta} \begin{bmatrix} 2 & 5 \\ 3 & -2 \end{bmatrix} \\ &= \frac{1}{11} \begin{bmatrix} 2 & 5 \\ 3 & -2 \end{bmatrix} \end{aligned}$$

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

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{11} \begin{bmatrix} 2 & 5 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} -19 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 5 \end{bmatrix}$$

Assignment:

p. 233

12-30 evens

Take-home Quiz 4.4-4.5

Ch. 4 Test is scheduled for Wed.!