Graphing Calculator Investigation

A Follow-Up of Lesson 4-8

Augmented Matrices

Using a TI-83 Plus, you can solve a system of linear equations using the MATRX function. An **augmented matrix** contains the coefficient matrix with an extra column containing the constant terms.

The reduced row echelon function of a graphing calculator reduces the augmented matrix so that the solution of the system of equations can be easily determined.

Write an augmented matrix for the following system of equations. Then solve the system by using the reduced row echelon form on the graphing calculator.

$3x + y + 3z = 2$
$2x + y + 2z = 1$
$4x + 2y + 5z = 5$

Step 1 Write the augmented matrix and enter it into a calculator.

The augmented matrix $B = \left[\begin{array}{ccc|c} 3 & 1 & 3 & 2 \\ 2 & 1 & 2 & 1 \\ 4 & 2 & 5 & 5 \end{array}\right]$.

Begin by entering the matrix.

KEYSTROKES: *Review matrices on page 163.*

Step 2 Find the reduced row echelon form (rref) using the graphing calculator.

KEYSTROKES: 2nd [MATRX] ▶ ALPHA [B] 2nd [MATRX] 2) ENTER

Study the reduced echelon matrix. The first three columns are the same as a 3×3 identity matrix. The first row represents $x = -2$, the second row represents $y = -1$, and the third row represents $z = 3$. The solution is $(-2, -1, 3)$.

Exercises

Write an augmented matrix for each system of equations. Then solve with a graphing calculator.

1. $x - 3y = 5$
$2x + y = 1$

2. $15x + 11y = 36$
$4x - 3y = -26$

3. $2x + y = 5$
$2x - 3y = 1$

4. $3x - y = 0$
$2x - 3y = 1$

5. $3x - 2y + z = -2$
$x - y + 3z = 5$
$-x + y + z = -1$

6. $x - y + z = 2$
$x - z = 1$
$y + 2z = 0$