

Matrices and Systems of Equations

Quick Start for College Algebra

Example 1

Write the augmented matrix for the given system of equations.

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

$$2x - y + 2z = 6$$

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

Definition - Matrices

- A **matrix** is a rectangular array of numbers.
- The **dimensions** of a matrix is the number of rows and number of columns.

$$\begin{bmatrix} 3 & 2 & 5 & -4 \\ -1 & 0 & -3 & 2 \\ 7 & 3.2 & 9 & 3.6 \end{bmatrix}$$

The matrix above has dimensions 3 x 4.

How To – Turn a System of Equations into a Matrix

1. Write the coefficients of the x-terms as the numbers down the first column.
2. Write the coefficients of the y-terms as the numbers down the second column.
3. If there are z-terms, write the coefficients as the numbers down the third column.
4. Write the constants in the fourth column.

Example 2

Solve the system by

$$2x + 3y = 6$$

Gaussian elimination.

$$x - y = \frac{1}{2}$$

Reduced Row Echelon Form

- A matrix is in reduced row echelon form if it looks like the matrix on the right.

$$\begin{bmatrix} 1 & 0 & 0 & a \\ 0 & 1 & 0 & b \\ 0 & 0 & 1 & c \end{bmatrix}$$

- You can read the solutions to a system from the right column.

Entering a Matrix

To enter a matrix in a TI graphing calculator:

1. Press 2nd and x^{-1} to enter the MATRIX menu.
2. Go right to EDIT.
3. Press 1 to edit matrix [A].
4. Type the dimensions of the matrix
5. Type the entries of the matrix.

Row Reducing a Matrix

To enter a matrix in a TI graphing calculator:

1. Enter the `MATRIX` menu.
2. Go right to `MATH`.
3. Go down to `B:rref(`.
4. Enter the `MATRIX` menu.
5. Press 1 to put matrix `[A]` on the home screen.
6. Close the parentheses and press `ENTER`.

Example 3

Solve the system by
Gaussian elimination.

$$5x + 3y + 9z = -1$$

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

$$-x - 4y + 5z = 1$$