For this quick start video, we will go through some examples of solving a system of equations using a matrix. We will focus on row reducing a matrix because that is the easiest method on a graphing calculator.

Example 1 asks us to represent the system of equations by an augmented matrix. We'll start by defining matrices and then saying how to represent a system of equations by a matrix.

A matrix is a rectangular array of numbers.

The dimensions of a matrix is the number of rows and the number of columns.

This example matrix is a 3 by 4 matrix.

To turn a system of equations into a matrix, first write the coefficients of the x terms in the first column of the matrix. The next column is the coefficients of the y-terms. Repeat this process for every variable. The right-most column is the constants from each equation.

For this system, the first column is 1, 2, 1. The other columns are 2, negative 1, negative 3, then negative 1, 2, 3, and finally 3, 6, and 4.

Normally, we write the matrix row by row. We'll do it that way for the rest of the video.

Example 2 is our ultimate goal for this video. We want to solve this system using Gaussian elimination. Gaussian elimination is the

process of writing a matrix in reduced row form. We will use a calculator to do the elimination.

A matrix is in reduced row echelon form if it looks like the matrix on the right. The is exactly one 1 in each row and each column on the left. The column on the right can be any numbers.

The solution to the system of equations is the entries in the rightmost column.

Our system of equations is equivalent to the matrix 2, 3, 6, and 1, negative 1, one half. We need to enter this matrix into the calculator before performing elimination.

To enter a matrix in a TI graphing calculator: First, press second and x inverse to enter the matrix menu. Second, go right to edit. Third, press 1 to edit matrix A. Fourth, type the dimensions of the matrix. Finally, type the entries of the matrix.

Here is our matrix entered into the calculator.

To row reduce our matrix, we need to: First, enter the matrix menu. Go right to math and down to the rref function. This puts the rref command on the home screen. Finally, go into the matrix menu and press 1 to put matrix A on the home screen. Close the parentheses and press enter.

Our matrix row reduces to 1, 0, 1.5, and 0, 1, 1. That means the solution to the system of equation is x equals 1.5 and y equals 1.

The last example asks us to solve the system of equations. The nice thing about solving a system of equations on a graphing calculator is that more variables doesn't add that much extra work.

Here is the matrix for this system. It is 5, 3, 9, negative 1, then negative 2, 3, negative 1, negative 2, then negative 1, negative 4, 5, 1.

This is the matrix ready to row reduce. I pressed math and 1 after the matrix steps to convert the entries of the answer to fractions.

Here is the row reduced matrix. Our solutions are x equals 61 over 187, y equals negative 92 over 187, and z equals negative 24 over 187. You could solve this system by hand, but I wouldn't recommend it.