Linear Systems Of Equations Using The TI-89 To Find Reduced Row Echelon Form

The TI-89 has a command, **rref**, which will put a matrix into reduced row echelon form, or reduced echelon form in the text's terminology. To use this command to solve a linear system of equations, we first need to enter the augmented matrix of the system into the machine. Although the TI-89 has sophisticated matrix-handling capabilities, we will keep it simple here. You use the square brackets to surround the elements of the matrix, commas between entries, and the semicolon at the end of a row. You can find the semicolon on your machine as the 2^{nd} of 9.

Example 1. Solve the system: 5x - 3y = 10
9x + 2y = 3.

Solution: Get the **rref** command in the work area of your machine, either from the catalog, or from item 4 of the matrix menu. The Matrix menu is item 4 on the MATH menu. Enter the matrix as described above so that you see the following: rref([5, -3, 10 ; 9, 2, 3])

Hit ENTER, and you should see: $\begin{bmatrix} 1 & 0 & 29/37 \\ 0 & 1 & \&75/37 \end{bmatrix}$. The machine has put the matrix in reduced row echelon form, and the interpretation is that the solution to the system is x = 29/37, y = -75/37.

Check: 5(29/37) -3(-75/37) = 10, 9(29/37) + 2(-75/37) = 3.

Example 2: Solve the system: x + 8z = 5
x + 2y + 14z = 9
2x + 3y + 25z = 16

Solution: Enter the following in your machine:
rref ([1, 0, 8, 5; 1, 2, 14, 9; 2, 3, 25, 16])
Hit ENTER and you should see:

$$\begin{bmatrix} 1 & 0 & 8 & 5 \\ 0 & 1 & 3 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

This translates to x + 8z = 5, y + 3z = 2. Solutions of the system consist of all ordered triples of the form (5 - 8c, 2 - 3c, c) for any real number c.

You should always check your solutions, even though the machine can be relied on to give correct results, since there is always a possibility of error when you enter the numbers in. To check example 2, you could let z have any value, then calculate x and y. For example, if z = 0, then x = 5 and y = 2. Check it by calculating: 5 + 0 = 5, 5 + 4 + 0 = 9, 10 + 6 + 0 = 16.

Example 3: Solve the system: x + y + z = 5
x + 2y + z = 11
x + y + z = 12

Solution: Upon reduction, the bottom row translates to 0 = 1, so no solution.