

Integrated 2
Solving Systems of Equations Using the TI-83+

Given a system of n equations with n variables, we can write the coefficients as a matrix A (dimensions $n \times n$), the variables as a matrix X (dimensions $n \times 1$), and the constants as a matrix B (dimensions $n \times 1$). We then have,

$$AX = B$$

Multiplying both sides on the left by A^{-1} ,

$$A^{-1}(AX) = A^{-1}(B)$$

Using the associative property,

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

From the properties of inverses,

$$(I)X = A^{-1}B$$

From the properties of the Identity matrix,

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

This implies we can solve for the variables in a system of equations by multiplying the inverse of the coefficient matrix by the constant matrix (in that order).

Using the graphics calculator will make this take much simpler. We will use the following example in order to see

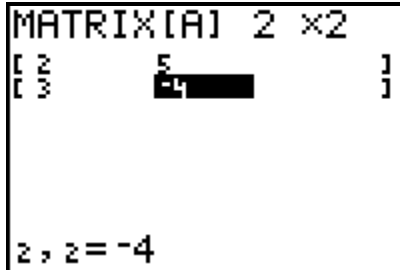
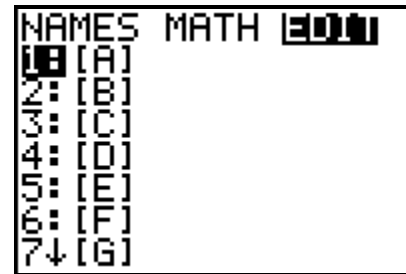
how the graphics calculator can be used to solve this system of equations.

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

$$3x - 4y = -13$$

To enter a matrix on the calculator, press **MATRX** (y —)

Press **~ ~** to highlight **EDIT**. You should see the screen to the right.



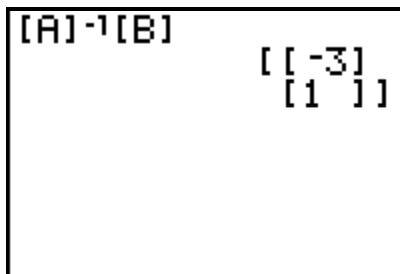
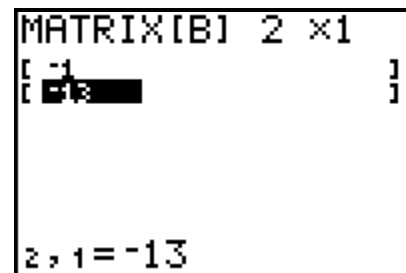
Press **↓** or **↵** to select matrix **A**. **A** will be a 2×2 matrix. So press **↵** **↵** **↓** **↵**. Press **↓** after each entry into the matrix, and you will be advanced to the next entry in the matrix. Enter the values of **A** (the coefficients), and you should see screen to the left.

Use the **|** **}** **~** **↑** keys to go back and correct any mistakes.

In order to get back to the main screen, press **QUIT** (y z).

To enter matrix **B** which is 2×1 , press **MATRX** (y —), press **~ ~** to highlight **EDIT**, **↑** or **↵**, then **↓**. You should see the screen below

Press **QUIT** (y z) after entering all the elements.



To solve the system we need to multiply $A^{-1}B$. To do this, we press **MATRX** (y —), **↓** or **↵** to select matrix **A**, **—** to get the inverse of **A**, and **MATRX** (y —), **↑** or **↵**, then **↓**. This enters the product of the inverse of **A** and **B**. To complete the problem press **↓**. You should see the screen to the left.

This means that $X = \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$