Name ____________________

Class ____________________

Problem 1 – Row Reduction Method

Consider the system of equations:

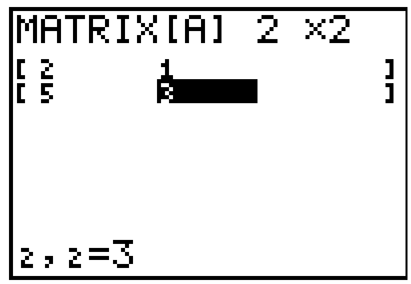
$2x + y = 5$

$5x + 3y = 13$

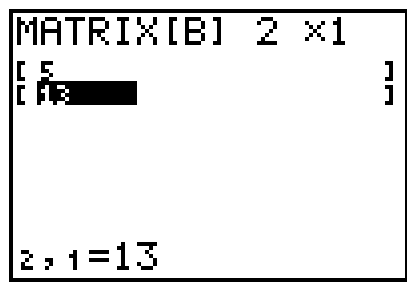
Let's use matrices to solve this system. Use a 2 by 2 matrix for the left side and a 2 x 1 for the right side.

Press [2nd] [MATRX] to access the **MATRIX** menu. Right arrow to **EDIT** and select **1:[A]**. Define matrix A as a 2 row by 2 column matrix by typing over the dimensions in the top line. Press [ENTER].

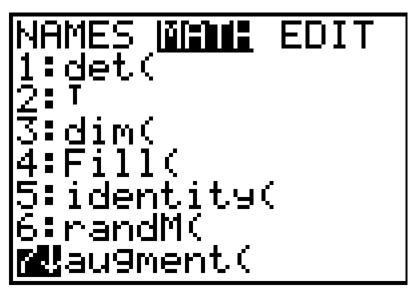
Type in the coefficients of *x* in the first column and *y* in the second column as shown.



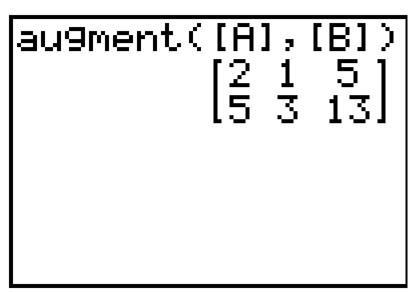
Next enter the dimensions and constants into matrix B, **2:[B]**, as done for matrix A.



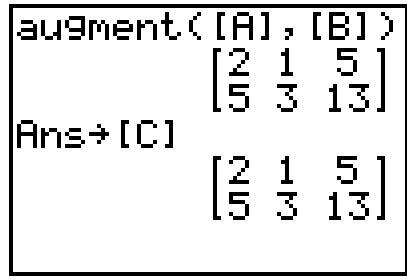
Now you need to augment matrices A and B into matrix C. From the Home screen, press [2nd] [MATRX], arrow to **MATH** and select **7:augment(**.



Now enter **[A], [B]**. To do this press [2nd] [MATRX] [1] [,] [2nd] [MATRX] [2]. Press [ENTER] to execute the command and augment A and B.



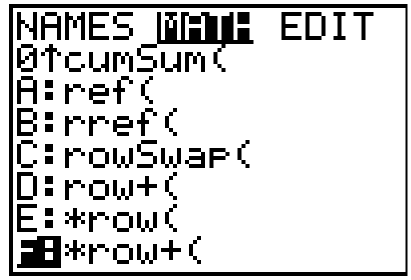
Store the result in matrix C. Press [STO▶] [2nd] [MATRX] and select **3:[C]**. Press [ENTER].



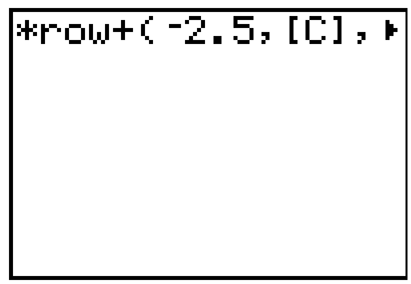
The next step to solve the system would be to eliminate *x* by multiplying the first equation by –2.5 and adding it to the second equation. This can be done using row operations.

Access the **MATRIX** menu, arrow to **MATH** and select **F:*row+(**.

(This command multiplies a row and adds it to another row.)



Enter **-2.5, [C], 1, 2)**. This tells the calculator to “multiply by –2.5 matrix C’s first row, and add the result in the second row.”



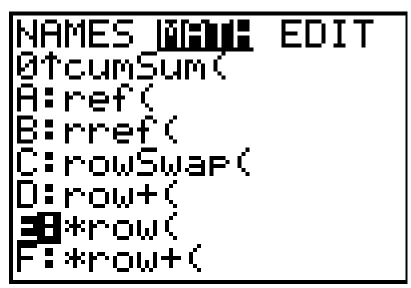
Press [ENTER]. This will NOT replace matrix C. Store the result in matrix D as you did for matrix C.

- What is your result?

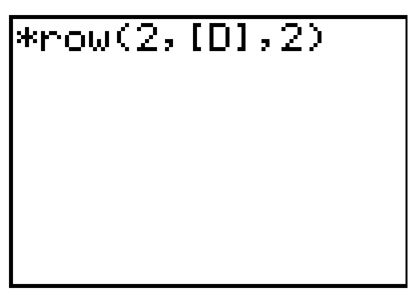
The goal is to get the coefficient of *y* to be 1. To do this requires doubling the second row.

In the **MATRIX > MATH** menu, select **E:*row(**.

(This command multiplies a row.)



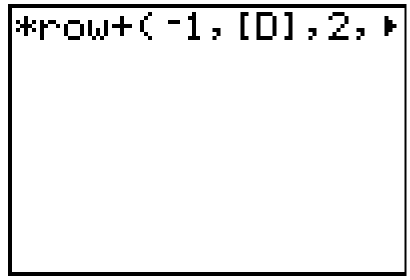
Enter **2, [D], 2)**. This tells the calculator to “multiply by 2 matrix D’s second row.”



Press [ENTER]. Store the result in matrix D (replace it).

- What is your result?

The next step to solve the system would be to eliminate *y* by multiplying the second equation by –1 and adding it to the first equation.



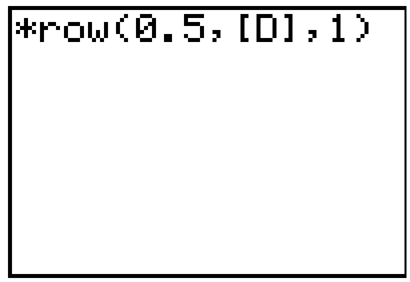
In the **MATRIX > MATH** menu, select **F:*row+(**.

Enter **-1, [D], 2, 1)**. This means: “multiply by –1 matrix D’s second row and add it to the first row.”

Store the result in matrix D.

- What is your result?

The goal here is to get the coefficient of *x* to be 1. To do this requires halving the first row.



Enter the command ***row(0.5, [D], 1)**. This means: “multiply by 0.5 matrix D’s first row.”

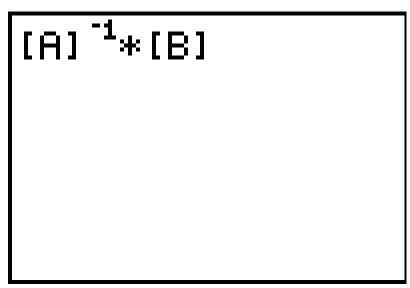
- What is your result?

The resulting matrix is in reduced row-echelon form. The last column indicates the solution to the system.

- What is the coordinate pair?

Problem 2 – Inverse Method

Now let’s use a quick method for using matrices to solve systems. Recall that matrix A contains the coefficients of *x* and *y* and matrix B contains the constants.



To do this, multiply the inverse of matrix A by matrix B.

Enter the command **$[A]^{-1}$*[B]** and press ENTER. The resulting matrix contains the solution.

- How does this solution compare to the solution in Problem 1?