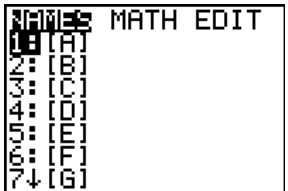

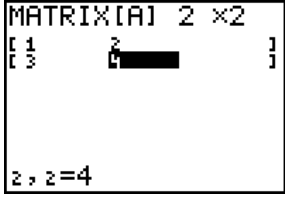
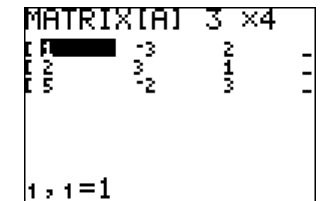


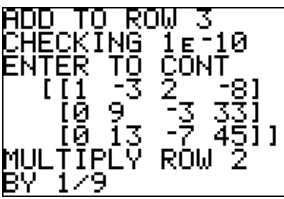
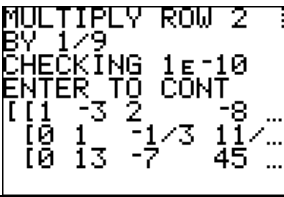
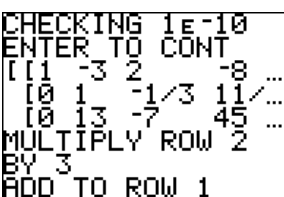
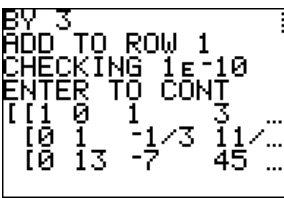
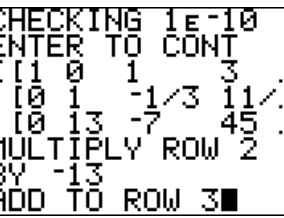
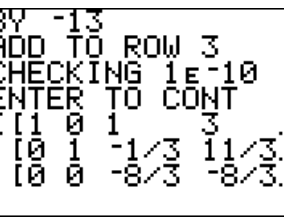
## Entering Matrices and Matrix Operations

<p><b>To enter a matrix</b>, go to [2<sup>nd</sup>][x<sup>-1</sup>] (MATRIX). There are three columns: NAMES, MATH, and EDIT.</p> <p>Arrow over to EDIT and arrow down to the name of the matrix to be entered.</p>	
<p>To enter the matrix <math>[A] = \begin{bmatrix} 1 &amp; 2 \\ 3 &amp; 4 \end{bmatrix}</math>, arrow over to EDIT. Since [A] is already highlighted, press [ENTER].</p>	
<p>Type in the dimensions of the matrix, in this case it is 2 x 2. Enter the numbers.</p> <p>As the data is typed, press [ENTER]. The cursor will automatically advance to the next element until all the elements have been filled.</p>	

## Using the ROWOPS Program

<p>ROWOPS is a program that must be loaded onto the calculator. It is used to solve a system of linear equations using the Gaussian Elimination Method.</p>	
<p>Enter an augmented matrix in MATRIX ([2<sup>nd</sup>][x<sup>-1</sup>]) A, B, C, D or E before entering the program. Always completely exit the program when finished by selecting option 5:Quit to Main and then 6: Quit. "Done" will appear on the screen to indicate a successful exit. If a wrong number, row or column is entered incorrectly, quit the program and start over or enter the last correct matrix and continue. It is difficult to back up and undo an error. The matrix is not saved as it is changed. The [CLEAR] button should not be used while in the program.</p>	
<p>Solve the following system of equations:</p> $\begin{cases} x - 3y + 2z = -8 \\ 2x + 3y + z = 17 \\ 5x - 2y + 3z = 5 \end{cases} \rightarrow$	$\left[ \begin{array}{ccc c} 1 & -3 & 2 & -8 \\ 2 & 3 & 1 & 17 \\ 5 & -2 & 3 & 5 \end{array} \right]$
<p>1. [2<sup>nd</sup>][x<sup>-1</sup>] (MATRIX), select EDIT and enter the 3x4 augmented matrix (usually matrix [A]).</p>	
<p>2. Go to [PRGM], choose ROWOPS, then press [ENTER].</p>	

<p>3. Select the desired matrix. ( 1: [A] for this example)</p>	<pre>*SELECT MATRIX* 1: [A] 2: [B] 3: [C] 4: [D] 5: [E] 6: QUIT</pre>
<p>4. Choose from the operations in the menu: Use option 3 to get a leading 1 (#3 multiply a row by a constant (the reciprocal).) Use option 4 to get zeros (#4 multiply a row by a constant (the opposite) and add the row to another row)  With each operation, follow the prompts and press [ENTER] after each entry.</p>	<pre>***OPERATIONS*** 1: rowSwap( 2: row+( 3: *row( 4: *row+( 5: QUIT TO MAIN</pre>
<p>5. R1 C1 already has a 1. To get a zero in R2 C1 choose #4 from the operations menu.</p>	
<p>6. Multiply Row 1 by -2 and Add to Row 2 <u>Proper Notation:</u> <math>-2R_1 + R_2</math></p>	<pre>CHECKING 1E-10 ENTER TO CONT [[1 -3 2 -8]  [2 3 1 17]  [5 -2 3 5]] MULTIPLY ROW 1 BY -2 ADD TO ROW 2</pre>
<p>7. The following matrix will result:</p>	<pre>BY -2 ADD TO ROW 2 CHECKING 1E-10 ENTER TO CONT [[1 -3 2 -8]  [0 9 -3 33]  [5 -2 3 5]]</pre>
<p>8. To get a zero in R3 C1, choose #4 from the operations menu.</p>	
<p>9. Multiply Row 1 by -5 and Add to Row 3 <u>Proper Notation:</u> <math>-5R_1 + R_3</math></p>	<pre>CHECKING 1E-10 ENTER TO CONT [[1 -3 2 -8]  [0 9 -3 33]  [5 -2 3 5]] MULTIPLY ROW 1 BY -5 ADD TO ROW 3</pre>
<p>10. The following matrix will result:</p>	<pre>BY -5 ADD TO ROW 3 CHECKING 1E-10 ENTER TO CONT [[1 -3 2 -8]  [0 9 -3 33]  [0 13 -7 45]]</pre>
<p>11. To get a leading 1 in R2 C2, choose #3 from the operations menu.</p>	

<p>12. Multiply Row 2 by 1/9  <u>Proper Notation:</u> <math>1/9R_2</math></p>	
<p>13. The following matrix will result:          (arrow left and right to see the whole matrix)</p>	
<p>14. To get a zero in R1 C2, choose #4 from the operations menu.</p>	
<p>15. Multiply Row 2 by 3 and Add to Row 1  <u>Proper Notation:</u> <math>3R_2 + R_1</math></p>	
<p>16. The following matrix will result:          (arrow left and right to see the whole matrix)</p>	
<p>17. To get a zero in R3 C2, choose #4 from the operations menu.</p>	
<p>18. Multiply Row 2 by -13 and Add to Row 3  <u>Proper Notation:</u> <math>-13R_2 + R_3</math></p>	
<p>19. The following matrix will result:          (arrow left and right to see the whole matrix)</p>	
<p>20. To get a leading 1 in R3 C3, choose #3</p>	

<p>from the operations menu.</p>	
<p>21. Multiply Row 3 by <math>-\frac{3}{8}</math>  <u>Proper Notation:</u> <math>-\frac{3}{8}R_3</math></p>	<pre> ADD TO ROW 3 CHECKING 1E-10 ENTER TO CONT [[1 0 1 3  [0 1 -1/3 11/3...  [0 0 -8/3 -8/3... MULTIPLY ROW 3 BY -3/8 </pre>
<p>22. The following matrix will result:          (arrow left and right to see the whole matrix)</p>	<pre> MULTIPLY ROW 3 BY -3/8 CHECKING 1E-10 ENTER TO CONT [[1 0 1 3  [0 1 -1/3 11/3...  [0 0 1 1 </pre>
<p>23. To get a zero in R1 C3, choose #4 from the operations menu.</p>	
<p>24. Multiply Row 3 by <math>-1</math> and Add to Row 1  <u>Proper Notation:</u> <math>-1R_3 + R_1</math></p>	<pre> CHECKING 1E-10 ENTER TO CONT [[1 0 1 3  [0 1 -1/3 11/3...  [0 0 1 1 MULTIPLY ROW 3 BY -1 ADD TO ROW 1 </pre>
<p>25. The following matrix will result:          (arrow left and right to see the whole matrix)</p>	<pre> BY -1 ADD TO ROW 1 CHECKING 1E-10 ENTER TO CONT [[1 0 0 2  [0 1 -1/3 11/3...  [0 0 1 1 </pre>
<p>26. To get a zero in R2 C3, choose #4 from the operations menu.</p>	
<p>27. Multiply Row 3 by <math>\frac{1}{3}</math> and Add to Row 2  <u>Proper Notation:</u> <math>\frac{1}{3}R_3 + R_2</math></p>	<pre> CHECKING 1E-10 ENTER TO CONT [[1 0 0 2  [0 1 -1/3 11/3...  [0 0 1 1 MULTIPLY ROW 3 BY 1/3 ADD TO ROW 2 </pre>
<p>28. The following matrix will result:</p>	<pre> BY 1/3 ADD TO ROW 2 CHECKING 1E-10 ENTER TO CONT [[1 0 0 2]  [0 1 0 4]  [0 0 1 1] </pre>
<p>29. The process is finished when there is an identity matrix on the left. State the solutions as: <math>x = 2</math>, <math>y = 4</math>, <math>z = 1</math> or as the ordered triple <math>(2, 4, 1)</math></p>	

30. To exit the ROWOPS program, select [5]:Quit to Main from the operations menu, then select [6]:Quit to completely exit the program.

```
**OPERATIONS***  
1:rowSwap(  
2:row+(  
3:*row(  
4:*row+(  
5:QUIT TO MAIN  
  
**SELECT MATRIX**  
1:[A]  
2:[B]  
3:[C]  
4:[D]  
5:[E]  
6:QUIT
```

31. "Done" will appear on the calculator screen, to indicate a successful exit from the program.

```
[[1 0 0 2]  
 [0 1 0 4]  
 [0 0 1 1]]  
 Done
```