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Math 7 Elementary Linear Algebra
TI-84 PLUS GRAPHING CALCULATOR INSTRUCTIONS FOR PERFORMING GAUSSIAN AND GAUSS-JORDAN ELIMINATION

The **MATRX** menu (2nd function, x^{-1}) contains the tools needed to define matrices and put them into row-echelon or reduced row-echelon form.

Defining a Matrix. To define a matrix, select **EDIT** and then select a matrix name (*e.g.*, matrix $[\mathrm{A}]$) by entering the number on the keypad which is associated with that matrix or by scrolling to the desired name and pressing ENTER on the keypad.

Define the size of the matrix by entering values for the number of rows and columns. Remember: an $m \times n$ matrix has *m* rows and *n* columns.

Enter the matrix elements by filling in row entries. The calculator will automatically advance from entry to entry as you hit ENTER, moving horizontally across each row from left to right and down to the next row once a row is filled in. Notice that at each entry, the calculator gives the row and column indices of the entry.

Row-Echelon Form. To obtain a matrix in row-echelon form, use the **ref** command from the **MATH** sub-menu of the **MATRX** menu. First select **ref** from the **MATH** sub-menu, then select the matrix you want to work on from the main **MATRX** menu. Hit enter. The matrix is displayed in row-echelon form.

Reduced Row-Echelon Form. To obtain a matrix in row-echelon form, the steps are similar except you use the **rref** command from the **MATH** sub-menu of the **MATRX** menu. The matrix is displayed in reduced row-echelon form.

Elementary Row-Operations. The calculator has built-in functions that allow you to carry out the steps of Gaussian or Gauss-Jordan elimination without having to worry about the tedious arithmetic details. These functions are found in the **MATH** sub-menu of the **MATRX** menu. You can

1. interchange two rows using the **rowSwap** command. To interchange rows *i* and *j*, the syntax is

   rowSwap(*matrixname, row i, row j*)

   For example, **rowSwap**($[\mathrm{C}]$, 2, 3), would interchange rows and 3 in matrix *C*.

2. replace a row with the result of adding it to another row.
   To replace row *j* with row *j* + row *i*, the syntax is

   row+(*matrixname, row i, row j*)

   For example, **row+**($[\mathrm{C}]$, 2, 3) would replace row 3 in matrix *C* with row 2 + row 3.

BE CAREFUL: order matters! The row **you want to replace** must be listed **second.**

3. replace a row with a scalar multiple of itself. The syntax is

$*$**row**(*scalar, matrixname, row i*)

For example, $*$**row**(-2, $[\mathrm{C}]$, 4) would replace row 4 in matrix *C* with $-2\times\mathrm{row}4$.

4. replace a row by adding it to a scalar multiple of another row. The syntax is

$*$**row+**(*scalar, matrixname, row i, row j*)

For example, $*$**row**(-2, $[\mathrm{C}]$, 1, 3) would replace row 3 in matrix *C* with $-2\times\mathrm{row}1+\mathrm{row}3$.

BE CAREFUL: order matters! The row **you want to replace** must be listed **second.**

After performing any one of these row operations you can save the changed matrix by using the STO $\mapsto$ key. For example,

$$\text{ANS} \mapsto [\mathrm{C}]$$

stores the result of performing a row operation to the matrix location $[\mathrm{C}]$. This allows you to carry out elementary row operations on the matrix and save the results at each step without entering the new matrix data at each step.