

Matrix and Vector Commands on the TI89

I. Defining matrices and vectors:

A. From the keyboard:

1. The format for an $m \times n$ matrix is $[[r_1] [r_2] \dots [r_m]]$, where each r_i is a list of the n entries in the i^{th} row. Note that there are **no commas** between the rows.

Example: The 2×3 matrix $\begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 3 \end{bmatrix}$ is entered as $[[2, 1, 0][1, 2, 3]]$.

You can **STORE** the matrix to any variable name by using $\text{STO} \rightarrow \text{var}$.

2. i. The format for a $1 \times n$ **row** vector is $[x_1, x_2, \dots, x_n]$.
ii. The format for an $n \times 1$ **column** vector is $[[x_1] [x_2] \dots [x_n]]$

Example: The column vector $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ is entered as $[[1] [2] [3]]$. It will appear as a column vector on the screen. The row vector $[1, 2, 3]$ is entered as $[1, 2, 3]$.

B. Entering matrices and vectors with the DATA/MATRIX EDITOR:

Enter the APPS menu and select the Data/Matrix Editor . You will be prompted with:

1. Current
1. Open
2. New

Here is a brief summary of how to use each of the three choices.

For a **new** matrix, select New (#3). At the Data Prompt, press the right cursor arrow and select Matrix (#2). Cursor down to Folder. Press the right cursor arrow and select main. Cursor down to Variable. Enter the name of the variable to which the matrix under construction will be stored. (Remember to use the alpha key.) Cursor down to enter row dimension; cursor down again for column dimension. Then press enter again to store you matrix.

Use the option **current** (#1) to edit the matrix currently in the Data/Matrix matrix window. You can add columns and rows by simply using the cursor to move to the next available position. Other options are available through the F6 key (Utilities.)

To open a previously defined matrix, use the option **open** (#2). Proceed as for a new matrix until you come to the line labeled variable. Press the right cursor. The list of previously defined matrices will appear. Select the matrix you want to edit from the list. Hit enter twice to obtain the editing screen.

Vectors (row and column) may be defined as appropriately dimensioned matrices. So row vectors are entered as $1 \times n$ matrices and column vectors are entered as $n \times 1$ matrices.

Return to the home screen (HOME) to use the matrices that are defined. You access your matrix by entering the variable name to which you stored it.

II. Using vectors and matrices:

1. To **add or multiply** two appropriately sized matrices or multiply by a scalar, just use the ordinary + and * on the keyboard. For example, $A+B$, $A*B$, $2*A$. Positive powers of square matrices can be obtained using the exponential key, for example, $A^3 = A*A*A$. To compute the inverse of a square matrix A , enter A^{-1} .
2. To compute the **determinant** or **transpose** of a matrix, enter the MATH menu and select the Matrix submenu (#4). For example, to find the determinant of A , select det(and enter A . Remember to use the alpha key to type A and and to close the parentheses. To find the transpose, type A first and then go to the menu to select T (#1).
3. Other options in the matrix submenu of the MATH menu allow you to commute the **rref** or **ref** of a matrix, to **augment** it, or to perform **row operations**, etc. For example, to find the Reduced Row Echelon form of A , select and type rref(A). To obtain a 4x4 **identity** matrix, select and type identity (4).(Store it to a variable of your choice.)

Example :

To replace the 2nd row of a matrix A by the sum of the second row and 3 times the first row, cursor far down to option J. Then select mRowAdd (3, A , 1, 2). Syntax*:
mRowAdd(scalar, matrix, row multiplied, row added to).

To swap rows, use rowSwap(A , R1,R2) to swap row R1 and row R2 in matrix A .

To multiply a row by a constant, use mRow(c , A , R1) to multiply row R1 in matrix A by c .

*Remember that if you call a command up from the **catalog**, the syntax will appear on the bottom of the screen.

4. To find the **norm** of a **vector** cursor down to option H in the matrix submenu of the math menu and select norm. Other **vector** specific operations are found under option L. For example, to find the dot product of vectors v and w , select and type dotP(v , w).