



Matrix Tutorial

Audio Graphing Calculator

This tutorial will help you learn the correct syntax for using the matrix calculator. Before we can try a few practice equations, it is necessary to learn the syntax for entering a matrix into the calculator. Each matrix begins and ends with a bracket. Each column is represented by a comma and each row is represented by a semicolon. Let's look at an example. The matrix [1,2,3;4,5,6] can also be viewed as the following:

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$$

Now that you know how to enter a matrix, let's try adding two of them together.

Enter the following into the matrix input textbox and press return:

$$[1,2,3;4,5,6] + [6,5,4;3,2,1]$$

Your output should be this: [7,7,7;7,7,7]

Now try this:

$$[1;2;3;4;5;6] + [1,2,3,4,5,6]$$

You will get an error message for this matrix addition problem. When adding two matrices together, they must have the same dimensions. That is, they must have the same number of columns and rows. In our example, the first matrix has only one column while matrix two has 6. The opposite is true for the number of rows.

Matrix multiplication is a little different. You must still keep track of your numbers of columns and rows, but the numbers of rows and columns relate differently. The first matrix may have as many columns and/or rows as you like. The second matrix must have as many rows as the first matrix does columns. Try the following exercise:

Enter the following equation into the matrix input textbox:

$$[1,2,3] * [4;5;6]$$

After evaluation, your answer should be 32. Let's try another.

$$[1,2,3;4,5,6] * [1,2;3,4;5,6]$$

Your answer should now be [22,28;49,64]. The answer matrix will always have the number of rows equal to your first matrix and the number of columns equal to your second matrix.

In addition to multiplication and addition, the matrix calculator also supports subtraction and division. You cannot divide by a matrix, but you can divide a matrix by a number. You may also use the inverse function to obtain an inverse matrix. Use the expression $\text{inv}[1,2;3,4]$ to obtain the inverse of $[1,2;3,4]$. You can also obtain the determinant using the det function or solve a matrix using the solve function.

Finally, you may also assign names to commonly used matrices in the same manner you assigned constants in the evaluator tutorial. Just type in the desired name followed by the equals sign, and then input your matrix. For example:

$$\text{Matrix1} = [1,1,2;2,2,3;3,3,4]$$

In the future, whenever you wish to use the matrix $[1,1,2;2,2,3;3,3,4]$ you may instead substitute the name Matrix1.

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