

Working With Matrices In Excel

To work with matrices in excel, especially with the multiplications and inverse, you have to follow the following steps

- 1- Select suitable (m x n) block anywhere else in your spreadsheet to receive the expected results on them.
- 2- Press the “F2” key. • Press the “=” sign
- 3- Type the matrix function with its arguments.
- 4- Hold down the keys “Ctrl” and “Shift” at the same time and press the “Enter” key while holding down the other two.

Example:

Find the inverse of

$$A = \begin{pmatrix} 2 & -2 & 1 \\ 3 & 1 & -1 \\ 1 & -3 & 2 \end{pmatrix}$$

A^{-1} should now appear in the block of cells you had selected (see screen shot on the right below).

	A	B	C	D
1	2	-2	1	
2	3	1	-1	
3	1	-3	2	
4				
5	=MINVERSE(A1:C3)			
6				
7				

	A	B	C	D
1	2	-2	1	
2	3	1	-1	
3	1	-3	2	
4				
5	-0.5	0.5	0.5	
6	-3.5	1.5	2.5	
7	-5	2	4	

If something weird appears (like only one number appearing), you may have pressed the **Enter** key without holding down the **Ctrl** and **Shift** keys. If this is the case re-select the cells you had chosen for your A^{-1} and press the **Delete** key, then repeat the above steps.

If A^{-1} does not exist, e.g. the matrix $B = \begin{pmatrix} 2 & -4 \\ -3 & 6 \end{pmatrix}$ has no inverse since $\det(B) = 0$, you may get something that looks like this:

	A	B	
1	2	-4	
2	-3	6	
3			
4	#NUM!	#NUM!	⚠
5	#NUM!	#NUM!	
6			

Example

Example:

Find the A.C, such that

$$A = \begin{pmatrix} 2 & -2 & 1 \\ 3 & 1 & -1 \\ 1 & -3 & 2 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 1 \\ 2 & 1 \\ 2 & 3 \end{pmatrix}$$

Solution

As an illustration, let A be as given above and $C = \begin{pmatrix} 1 & 1 \\ 2 & 1 \\ 2 & 3 \end{pmatrix}$. Since A is a 3×3 matrix and C is a 3×2 matrix, the product AC is a 3×2 matrix. Performing the above steps will give the following screen shots:

	A	B	C	D	E	F
1	2	-2	1		1	1
2	3	1	-1		2	1
3	1	-3	2		2	3
4						
5	=MMULT(A1:C3,E1:F3)					
6						
7						

	A	B	C	D	E	F
1	2	-2	1		1	1
2	3	1	-1		2	1
3	1	-3	2		2	3
4						
5	0	3				
6	3	1				
7	-1	4				

We are now ready to find the solution to our system of equations.

Solving the system of Equations

Enter the right-hand-side column vector $\mathbf{b} = \begin{pmatrix} 3 \\ 7 \\ 0 \end{pmatrix}$ into a 3×1 block of cells in your spreadsheet. Also enter the matrix A into a 3×3 block of cells in your spreadsheet.

Since we will get the solution from the matrix product $A^{-1}\mathbf{b}$, we first determine the order of the resultant matrix. In this case, we are multiplying a 3×3 matrix by a 3×1 vector, we will get a 3×1 vector.

Select a 3×1 block of empty cells. Type the following: **F2 = MMULT(MINVERSE(** and select the cells containing matrix A . Close bracket **)**. Type a comma and select the cells containing the vector $\mathbf{b}$ and close bracket **)**. You should have something that looks like this:

	A	B	C	D	E
1	2	-2	1		3
2	3	1	-1		7
3	1	-3	2		0
4					
5		=MMULT(MINVERSE(A1:C3),E1:E3)			
6					
7					

Hold down the **Ctrl** and **Shift** keys and press the **Enter** key while still holding the other two keys. The values of x, y and z should now appear (see screen shot below).

	A	B	C	D	E
1	2	-2	1		3
2	3	1	-1		7
3	1	-3	2		0
4					
5		2			
6		0			
7		-1			

Note that we did not have to calculate A^{-1} separately. We simply asked Excel to calculate it for us and then multiply the inverse by $\mathbf{b}$. Most Excel functions can be nested in this way.

Matrix determinant

Example 1 - 2x2 Matrix

The spreadsheet on the right shows a simple 2x2 matrix. The determinant of this matrix can be calculated using the Excel Mdeterm function as follows:

`=MDETERM( A1:B2 )`

This gives the result **-9**.

	A	B
1	5	2
2	7	1

Example 2 - 3x3 Matrix

The determinant of the simple 3x3 matrix on the right can be calculated using the following Excel Mdeterm function:

`=MDETERM( A1:C3 )`

This gives the result **40**.

	A	B	C
1	6	4	2
2	3	5	3
3	2	3	4