

# Course N°3 Matrix in MATLAB



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# 📣 MATLAB®



# 1. Definition a matrix

A matrix is a surrounded by brackets and may have an arbitrary number of rows and columns; for example,

the matrix

	(1	2	3)	
A =	4	5	6	(1)
	7	8	9)	

To create a such matrix in MATLAB, the following basic conventions must be followed:

- $\checkmark$  Separate the elements of a row with spaces or commas ","
- $\checkmark$  Use a semicolon ";" to indicate the end of each line or row
- ✓ Surround the entire list of items with square brackets [ ].

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# 2.Operations with matrices

One of the advantages of MATLAB is the ability to directly use pre-defined mathematical operations  $(+, -, /, \times)$  for matrices. To illustrate this special feature, consider two matrices, *a* and *b*, of 3 by 3 elements.

# 2.1.Addition of matrices



You can add two matrices direct. Both matrices must have the same dimension or number of elements which mean both number of row and columns should be equal in the two matrices (pay attention to dimensions which should be similar or the same).

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# 2.2.Subtraction of matrices

Is the difference between two matrices or more, whose defined in MATLAB by the following way.

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#### 2.3. Multiplication of matrices

A matrix product or multiplication is noted \* and is defined if the number of columns in the first matrix is

equal to number of rows in the second matrix; for example, we have the matrix product



# 2.4.Division of matrices

For division, the usual operators (/) are defined for matrix division. Whereas the number of columns in the

first matrix should be equal to number of rows in the second matrix

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#### Or we can calculate as follows

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#### 2.5.Addition and subtraction of matrices by a scalar

Addition or subtraction of a matrix with a scalar are the addition and/or subtraction of that scalar from each

element in the matrix.





2.6.Multiplication and division of matrices by a scalar

The multiplication of a such matrix with a scalar are the multiplication of that scalar with each element in

the matrix; similarly, for the division which are the division of each element in that matrix with the scalar.

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#### 2.7. Multiplication a matrices element by element

In case the multiplication of two matrices (.\*) element by element (attention with the dimension of the

matrices which should be the same), the result will be a matrix with the same dimension.

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#### 2.8.Division a matrices element by element

In case the division of two matrices (./) element by element (attention with the dimension of the matrices

which should be the same), the result will be a matrix with the same dimension.

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# 3.Special or particular matrices

In MATLAB, there are functions that automatically generate specific matrices for example containing all

ones, zero elements, ones in the diagonal only, arbitrary number.





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# Note:

It is interesting to note that in case the matrix square (r=c), one argument will be sufficient; ones(3), eye(3)

, and zeros(3)



# 4.Other useful MATLAB functions

For matrices, to find or extract the highest and/or lowest value or number in the whole matrix, we use the command/function max(.) and/or min(.) two times because these are matrix with two dimensions not one dimension.



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Again, in order to find or evaluate the summation and/or production of such element in the matrix, we use the command/function sum(.) and prod(.)

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The mean of a matrix, also known as the average which equal the sum of the numbers in each row in the matrix divided by the number of rows and then the result will sum again and divided on the number of columns, using the command/function mean(.)



# 5.MATLAB output

# 5.1.The *diag* command

Displaying or to generate a diagonal of a matrix, using the command/function diag(.)



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#### 5.2. The transpose and/or trans command

Transpose a matrix, rows become a columns and columns become rows.



Or



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#### 5.3.The *inv* command

To display an of a , just type the command/function and the inverse of the matrix will be printed in the screen





#### 5.4. The *size* and *length* commands

To display the dimension of a matrix, just type the command/function size(.) and the dimension will be printed in the screen; to display the highest dimension in the matrix, just type length(.) and the dimension will be printed in the screen.



Fig 21. Display the main difference and the relation between two commands size(.) and length(.)

#### 6.Matrix and submatrix manipulations

#### 6.1.Pick and/or replace command

To show or peak or extract only one value from matrix already written by MATLAB, we need to know

- $\checkmark$  The name of the matrix first,
- $\checkmark$  Second, the position of that element in row and column of the matrix

Similarly, to replace one value from matrix, we need to know

- $\checkmark$  The name of the matrix
- $\checkmark$  Second, specify the position of the element by number of row and column in the matrix
- $\checkmark$  Third, give the new number or value





#### 6.2.Replace in many positions command

To replace a specific number or value in different places from a matrix already written by MATLAB, we need to know the position or the order of each element in that matrix.



# 6.3.Display submatrix command



To display a submatrix from a matrix already written by MATLAB, we need to know the position or the order of each element in that matrix.

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24. D	isplay	a sub	matrix fr	om a giv	en m	atrix						

# 6.4.Remove row and/or column command

To remove a row or column from a matrix already written by MATLAB, we need to know the position or the order of these columns and rows in that matrix

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# 6.5.Adding column command

To add a column from the left or the right side into a matrix already written by MATLAB, we need to know the position as well.

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#### 6.6.Adding row command

To add a row from the left or the right side into a matrix already written by MATLAB, we need to know the position as well.

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