



4. Lab 4

✧ Vectors and matrices ✧

- Ⓡ First, see in the lectures' part of the Laboratory manual (polycopié des TPs), the counterpart chapter of this Lab.

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1. Consider the following matrix :

$$M = \begin{bmatrix} 6 & 9 & 12 & 15 & 18 & 21 \\ 4 & 4 & 4 & 4 & 4 & 4 \\ 2 & 1 & 0 & -1 & -2 & -3 \\ -6 & -4 & -2 & 0 & 2 & 4 \end{bmatrix}$$

First, evaluate the following expressions without using Matlab, then check your answers with Matlab.

- (a) $A = M([1, 3], [2, 4])$
 (b) $B = M(:, [1, 4:6])$
 (c) $C = M([2, 3], :)$
2. Consider the following system of linear equations :

$$\begin{cases} 5x - 3y + 2z & = 10 \\ -3x + 8y + 4z & = 20 \\ 2x + 4y - 9z & = 9 \end{cases}$$

- (a) Solve this system of linear equations by Gauss-Jordan elimination (Use the substitution method or the combination or elimination method) ?.

(b) Check your results with Matlab's '\ ' operator ?.

3. Create the following matrices :

$$A = \begin{bmatrix} 12 & 17 & 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 8 & 3 \\ 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix} \quad C = \begin{bmatrix} 22 \\ 17 \\ 4 \end{bmatrix}$$

- Assign to the variable x_1 the value of the second column of the matrix A.
 - Assign the third column of the matrix B to the variable x_2 .
 - Assign the third line of the matrix B to the variable x_3 .
 - Assign to the variable x_4 the first three elements of the matrix A as its first row, and all the elements of the matrix B as its second, third and fourth rows.
4. If the matrix A is defined using the Matlab code $A = [1 \ 3 \ 2; \ 2 \ 1 \ 1; \ 3 \ 2 \ 3]$, which command will produce the following matrix ?

$$B = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$$

5. Create the following matrices :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 2 & 2 \\ -1 & 2 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 1 & 2 \end{bmatrix}$$

- Do the following : $A+B$, $A*B$, $A+C$, $B*A$, $B-A$, $A * C$, $C-B$, $C*A$. what are the results? What error messages are generated? For what?
 - What is the difference between $A*B$ and $A .* B$?
6. Solve the following systems of linear equations. Don't forget to check your solutions :

(a)

$$\begin{cases} -2x + y = 3 \\ x + y = 10 \end{cases}$$

(b)

$$\begin{cases} 5x + 3y - z = 10 \\ 3x + 2y + z = 4 \\ 4x - y + 3z = 12 \end{cases}$$

(c)

$$\begin{cases} x_1 - 2x_2 - x_3 + 3x_4 = 10 \\ 2x_1 + 3x_2 + x_4 = 8 \\ x_1 - 4x_3 - 2x_4 = 3 \\ -x_2 + 3x_3 + x_4 = -7 \end{cases}$$

7. Create a vector t that ranges from 1 to 10 with a step of 1, and a vector θ that ranges from 0 to π and containing 32 elements. Now calculate the following :

$$x = 2\sin(\theta)$$

$$y = \frac{t-1}{t+1}$$

$$z = \frac{\sin(\theta^2)}{\theta^2}$$