

**FINAL EXAM (Standard correction)**  
**PROGRAMMING TOOLS FOR MATHEMATICS**

Duration : 1h 30

04 June 2024

Full name: .....	Mark /20
Domain/Group: .....	

**Exercise 01 : (04 points)**

Give briefly the signification of each of the following expressions:

1	<b>Workspace</b>	The window that indicates in detail all the variables used (name, size, ...etc) <b>(0.5)</b>
2	<b>strcut</b>	An easy way to combine different types of variables. for example: in strings without counting spaces <b>(0.75)</b>
3	.\	The element by element reverse division operation. <b>(0.5)</b>
4	<b>Gtext</b>	Used to put text on a position chosen manually by the mouse on a curve. Example: gtext('This point is chosen manually ') <b>(0.75)</b>
5	<b>Executif mode</b>	MATLAB executes an <b>.m file</b> line by line (a program in MATLAB language). <b>(0.75)</b>
6	<b>Grid on</b>	Command used to put a grid on the figure <b>(0.75)</b>

**Exercise 2: (04.5 pts)**

Let be the following matrix A =

$$\begin{bmatrix} 1 & 4 & 1 & -8 \\ 7 & 6 & 16 & 9 \\ 0 & 5 & 10 & 15 \\ 0 & -1 & 0 & 2 \end{bmatrix}$$

1 – Give the Matlab code that allows to create the Matrix A  
 $A=[1\ 4\ 1\ -8; 7\ 6\ 16\ 9; 0\ 5\ 10\ 15; 0\ -1\ 0\ 2]$ ..... **(0.5 pts)**

2 – Give the results of the following commands (commands are executed successively):

<pre>1&gt;&gt;A(:) &gt;&gt;ans= 1 4 1 -8 7 6 16 9 0 5               10 15 0 -1 0 2               A column vector <b>(0.5 pts)</b></pre>	<pre>5&gt;&gt; A + 3*eye(4) &gt;&gt;ans = 4 4 1 -8                         7 9 16 9                         0 5 13 15                         0 -1 0 5 <b>(0.5 pts)</b></pre>
<pre>2&gt;&gt; A(2:3,:) &gt;&gt;ans= 7 6 16 9                    0 5 10 15 <b>(0.5 pts)</b></pre>	<pre>6&gt;&gt; A(:,2)=[] &gt;&gt;A = 1 1 -8                     7 16 9                     0 10 15                     0 0 2 <b>(0.5 pts)</b></pre>
<pre>3&gt;&gt; A([1 3], 2:3) &gt;&gt;ans= 4 1                        5 10 <b>(0.5 pts)</b></pre>	<pre>7&gt;&gt; m = mean(A) &gt;&gt;m = 2 6.75 4.5 <b>(0.5 pts)</b></pre>
<pre>4&gt;&gt; A(end) &gt;&gt;ans= 2 <b>(0.5 pts)</b></pre>	<pre>8&gt;&gt; A(:,4)= [2 :2 :8] &gt;&gt;A = 1 1 -8 2                         7 16 9 4                         0 10 15 6                         0 0 2 8 <b>(0.5 pts)</b></pre>

**Exercise 03 : (07 points)**

Given the variables A,B and C containing: A=[4,3, 3, 4; 2,0,1,1; 1,3 ,2,3]; B=[3, 3, 1, 2]; C=[2, 4, 2, 0]  
 Evaluate the following Matlab commands:

<code>X1=max(A)</code>	X1= 4 3 3 4 .....(01 pts)
<code>X2= sum(B&gt;C)</code>	X2= 2 .....(01 pts)
<code>X3= B.*C</code>	X3= 6 12 2 0 .....(01 pts)
<code>X4=sum(triu(A,1))</code>	X4= 0 3 4 8 .....(01 pts)
<code>X5=A(2,:)*C'</code>	X5= 5 .....(01 pts)
<code>X6=linspace(1,2,3)</code>	X6= 1.0000 1.5000 2.0000 .....(01 pts)
<code>X7=C*B</code>	??? Error using ==> mtimes Inner matrix dimensions must agree. ....(01 pts)

**Exercise 4 : (04.5 pts)**

1- Let be the following function:

$$f(x) = \begin{cases} -2 + x^{10} & x \leq -1 \\ \frac{3}{x+1} & -1 < x < 1 \\ \sqrt{x^4 + 10} \quad \text{sinon} & \end{cases}$$

- Write a Matlab script that allows you to plot the curve of the function f(x) on the interval [-4 4].  
 Give the figure a title.

```
X1= [-4:0.5:-1]; Y1= -2+x.^10 .....(0.5 pts)
X2= [-1:0.5:1]; Y2= 3/(x+1) .....(0.5 pts)
X3= [1:0.5:4]; Y3= sqrt(x.^4 + 10) .....(0.5 pts)
Plot(X1, Y1, X2,Y2, X3, Y3) .....(0.25 pts)
Title('the curve of F(x)') .....(0.25 pts)
```

2- On the interval [-5 5], Plot on the same window the two functions  $g(x)=x^2 \cos x$  with color blue, and the function  $h(x)=x \cos x$  in red dotted line. Give the figure a grid.

```
Subplot(1,3,1) ; Plot(X1, Y1, X2,Y2, X3, Y3) .....(0.5 pts)
X= [-5:0.5:5] ; G=X.^2.* cos(X) .....(0.5 pts)
Subplot(1,3,2) ; plot (X,G, 'g:*') .....(0.5 pts)
H= X.* cos(X) .....(0.25 pts)
Subplot(1,3,3) ; plot (X, H, 'r--s') .....(0.5 pts)
Grid on .....(0.25 pts)
```

**Bonus Question : (01 points)**

Let be the matrix **D** defined by:

$$D = \begin{bmatrix} 3.4000 & 3.4000 & 0.6557 & 0.8491 \\ 3.4000 & 3.4000 & 0.0357 & 0.9340 \\ 3.4000 & 3.4000 & 1.0000 & 0 \\ 3.4000 & 3.4000 & 0 & 1.0000 \end{bmatrix}$$

1- Express **D** with a single statement in terms of *eye*, *ones*, *zeros*, *rand* and *diag*

```
D=[3.4* ones(4,2), [rand(2,2); eye(2) ]] .....(01 pts)
```

*Good Luck*