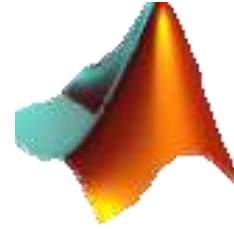


Lab N°3 Graph and M-File



Learning Objective

The objectives of this unit are to introduce some of basic concepts related to:

- 1) Matrices (cont.)
- 2) Interaction with the user: reading the values entered by the user and displaying results.
- 3) Graphical representation of mathematical functions and display of 2D curves and 3D.
- 4) Saving workspace variables and programming in Script mode.

Exercise 1:

Give the result of the following expressions without the help of Matlab and at the end check on Matlab if your results are correct.

- $(\sim 0 \mid 0) \mid (0 \& 0)$
- $((\sim 1 \mid 0) \& (0 \& 0)) \mid (1 \& 0)$
- $(\sim (0 \& 1)) \mid (1 \& 1)$

Suppose a is a logical variable. Determine the value of the following expressions, then test on Matlab for a=0 and 1 and b=0 and 1.

- $\sim \sim a$
- $a \mid \sim a$
- $a \& \sim a$
- $(a \& b) \mid (a \& \sim b)$ where b is another logical variable.

Exercise 2:

1. Write shortest scripts to evaluate and represent mathematical functions following:

$$h(t) = \begin{cases} T-10 & \text{when } 0 < T < 100 \\ 0.45T+900 & \text{when } T > 100 \end{cases}$$

2. Draw h for a variation of T between 0 and 150.

Exercise 3:

Test the following scripts a, b and c and observe the results.

```
%a
result = 10;
switch(result)
case 20
    disp('result is 20')
case {10}
    disp('result is 10')
end

%b
result = 10;
switch(result)
case {10, 30}
    disp('result is 10 or 30')
case 10
    disp('result is 10')
end

%c
result = 10;
switch(result)
case 20
    disp('result is 20')
case {50, 30}
    disp('result is 50 or 30')
otherwise disp('no correspondence.') end
```

Exercise 4:

Given the vector $x = [1 \ 5 \ 4 \ 9 \ 1 \ 0 \ 6 \ 11]$, write a Matlab script which allows you to perform the following tasks:

- Calculate the total sum of the values of x .
- Calculate the cumulative sum for each value of x (this sum adds the value of the current element to the cumulative sum of the previous element).
- Calculate the sinus for each x value, look at the result plot.

Exercise 5:

Given the following two vectors (of equivalent sizes) $A = [7 \ 3 \ 8]$ and $B = [9 \ 7 \ 11]$, calculate the following tables using a single traversal for each vector.

- $a_{ij} = A_i \times B_j$
- $b_{ij} = A_i / B_j$

- c. $c_i = A_i \times B_i$, then sum all the elements of c.
- d. $d_{ij} = A_i / (2 + A_i + B_j)$
- e. $e_{ij} = \min(A_i, B_j)$

Exercise 6: The while...end loop

1. Create a script under the name “Ex6.m”, copy the empty scripts into this script following lines and click on execute:

```
% Script 1
x = 1;
while x < 777
    x = x*2;
    disp(x);
end
```

2. Execute the following script2

```
% Script 2
x = 1;
while x < 777
    disp(x);
    x = x*2;
end
```

- What do the script1 and script2 ?
3. Write a program that calculates the largest integer "n" satisfying the following equation (the number "m" must be entered by the user):

$$\sum_{i=1}^n (i+1)^2 \leq m$$

Exercise 7:

Create a script under the name “myStat.m”, then write two functions : moyenne and variance that use vector as parameter and calculates the mean and the variance.

Exercise 8:

Plot the graph of $y = x \exp(x^2) - \pi^2$ for $-3 \leq x \leq 2$ using a step-size of 0.02. You will need three dots in the expression to generate the array y.

Exercise 9:

Plot the graph of $y = \sin 9x + \sin 10.5x + \sin 12x$ for $-\pi \leq x \leq \pi$ using 601 points.

Example 10:

Suppose you want to plot the oscillations $y_1 = \cos t$, $y_2 = \cos 3t$ and their sum $y_3 = y_1 + y_2$, for $0 \leq t \leq 4\pi$, on the same axes. Here t is measured in seconds and y_1, y_2, y_3 are measured in cm.

Example 11:

Comment the lines of MATLAB code, execute it, and tell what it does.

```
t=0:0.1:10;
y1=sin(t);
y2=cos(t);
plot(t,y1,'r',t,y2,'b--');
x=[1.7*pi;1.6*pi];
y=[-0.3; 0.7];
s=['sin(t)'; 'cos(t)'];
text(x, y, s); % Add comment at (x,y)
title('Sin and Cos'); % Title
legend('sin','cos') % Add legend
xlabel('time') % the name of X-axis
ylabel('sin & cos') % the name of Y-axis
grid on % Add grid
axis square % set figure as a shape of square
```