Week 1 – Introduction to Matlab – matrices – functions – plotting

Example 1 – Useful commands and operators

You can use MATLAB's help to find information about functions among other topics. For example, type:

help clc

Here are some more commands to try and explore:

t = [1:10]

t = [1:0.1:3] ;

size(t) *length(t)* *linspace*

zeros(4,4) *ones(3,3)*

A = [1 2 3 ; 4 5 6] ;

A(2 , 2) *A(: , 2)*

The use of bitwise operations, operator '.' :

B = [10 20; 30 40] ;

*B*B* *B.*B*

B^3 *B.^3*

- Find a short MATLAB expression to build the matrix

$$B = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 9 & 7 & 5 & 3 & 1 & -1 & -3 \\ 4 & 8 & 16 & 32 & 64 & 128 & 256 \end{bmatrix}$$

for bottom line:
c(1) = 4
for n = 2:6;
c(n) = 2*c(n-1);
end

- Give a MATLAB expression that multiplies two vectors to obtain

a) the matrix

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 & 5 \end{bmatrix}$$

b) the matrix

$$\begin{bmatrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \\ 4 & 4 & 4 \end{bmatrix}$$

- Let v = [2 5 7 9]:

a) Add 16 to each element use v+16

b) Compute the square root of each element use v>^0.5

c) Compute the square of each element use v.^2

d) Add 3 to just the odd-index elements use v(1:2:end) = v(1:2:end)+3

Example 2 – Matrix multiplication and usage

You can multiply matrices in Matlab by simply using the operator * .

e.g. type in command window:

```
A = [1 2 3; 4 5 6; 7 8 9];
B = [0 5 3; 5 1 9; 1 3 4];
A*B
```

- To refresh your skills in Matlab, create your own function which multiplies two 2x2 matrices.

Create a new file in Matlab which starts as follows:

function C = my_mult(K,L)

my_mult is the name of your function, *K* and *L* are the arguments that the function will use (these are considered known and are defined, elsewhere, in the script that calls this function) and *C* is the matrix where the result of the function will be stored in.

In your function, define each element of matrix C and finally save the file. For example:

*C(1,1) = A(1,1)*B(1,1)+ A(1,2)*B(2,1);*

Note: there are also other ways of defining C, e.g. using *for* loops

Then, either from command window or from a different script (Matlab file) call the *my_mult* function by typing:

my_mult(A,B)

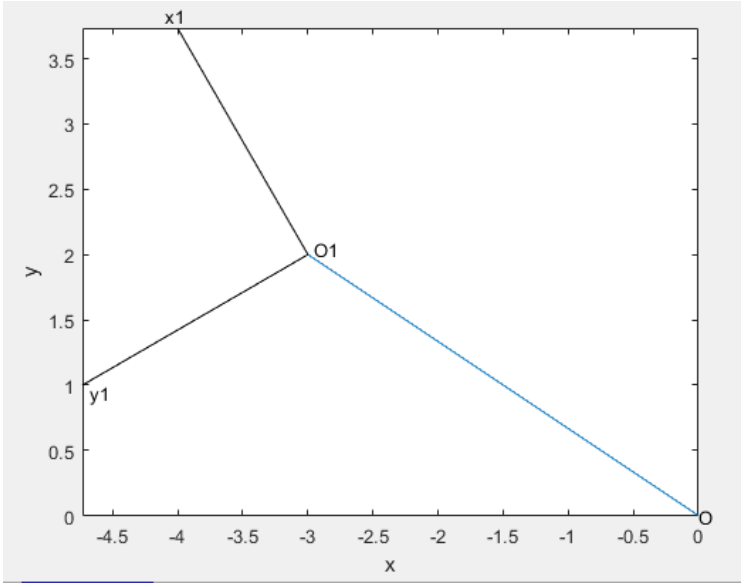
- Compare it with A*B.
- What happens if the arguments are not matrices with 2x2 dimensions? How can you check that the arguments are of the correct type and dimensions?

Examine *my_mult.m* and *simpleExample.m* from Blackboard.

Example 3 – Plotting – lines and vectors

A coordinate frame is rotated counter-clockwise around z axis (using right hand rule) by 120 degrees and translated by p = [-3 2 0]'.

- Plot this new frame using Matlab, as you can see in the figure below.



Examine *plotExample.m* from Blackboard.