ENGG1003 - PASS Session 9

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Monday	**14-15**	**ES238**
Wednesday	**12-13**	**ES238**
Thursday	**10-11**	**MCLG42**

MATLAB Basics

Command/Operation	Description
`help <function>`	displays the help for the function or keyword specified
`doc <function>`	opens the reference page for the function or keyword specified
`clear`	removes all variables from the *workspace*
`clc`	clears the *command window*

1. Perform the following operations in Matlab and interpret the results/error message.

   (a) `1:1:10` (b) `4:0.5:9` (c) `1:10`

   (d) `[1,2,3; 1,2]` (e) `[3:-1:1,12:16]` (f) `[4:7; 9:12]`

   (g) `[2:0.5:4; 1:4]` (h) `linspace(1,20,500)` (i) `linspace(15,10,1e3)`

2. Create the following vectors/matrices in Matlab.

   (a) $a = \begin{bmatrix} 1 & 2 \end{bmatrix}$ (b) $b = \begin{bmatrix} 3 & 4 \end{bmatrix}$

   (c) $c = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$ (d) $d = \begin{bmatrix} 1 \\ -6 \end{bmatrix}$

   (e) $e = \begin{bmatrix} 3/5 & 4 \\ 6 & -2 \end{bmatrix}$ (f) $f = \begin{bmatrix} -5 & 0.4 \\ 7 & -2.6 \end{bmatrix}$

3. Using the array definitions from question 2, perform the following operations in Matlab and interpret the results/error message.

   (a) `A = a+b` (b) `B = c-d` (c) `C = e.*f`

   (d) `D = d./c` (e) `E = 6*a` (f) `F = a+[1,2,3]`

   (g) `G = 2*b+3` (h) `H = e/2` (i) `I = [a;b]+e`

   (j) `J = 2*[c d]-f` (k) `K = a*b` (l) `L = a.*b`

   (m) `M = b^2` (n) `N = b.^2`

Array Indexing

4. Create the following vector in Matlab.

$$Y = \begin{bmatrix} 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 & 20 \end{bmatrix}$$

5. Perform the following commands in Matlab and interpret the results.

   (a) `A = Y(1)` (b) `B = Y(6)` (c) `C = Y([2 4 9])`

   (d) `D = Y(5:end)` (e) `E = X([3:7 9])` (f) `F = X([1:3 5:9])`

6. Create the following matrix in Matlab.

$$X = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}$$

7. Perform the following commands in Matlab and interpret the results.
   (a) `A = X(:,1)`
   (b) `B = X([1 3],:)`
   (c) `C = X(1:3,4)`
   (d) `D = X(3,3:4)`
   (e) `E = X(2:4,2:4)`
   (f) `F = X(1)`
   (g) `G = X(3)`
   (h) `G = X(10)`
   (i) `H = X(1,4)`
   (j) `I = X(4,[2 4])`
   (k) `K = X(:,:)`
   (l) `L = X(:)`
   (m) `M = X(1,end)`
   (n) `N = X(end,end)`

Plotting

Hint: The `help` *and* `doc` *commands are your friends when encountering unknown functions.*

8. (a) Create a Matlab *script* file called '`passWk10-plot.m`'.

   (b) Using the `plot` command, write a Matlab script that:
      i. Plots a single vector `Y = [2,5,3,2,1]`.
      ii. Plots the vector `Y` on y-axis against the vector `X = 0:0.5:2` on the x-axis.

   (c) Using the relevant commands, add a **title** (`title`), axis **labels** (`xlabel, ylabel`) and a **grid** (`grid`) to the previous figure.

   (d) Using the `axis` command, write Matlab code that will change the axis scale to $-5 \leq x \leq 5$ and $0 \leq y \leq 10$.

   (e) Using the `hold` command, write Matlab code that will plot the vectors `X` vs `Y` and another pair of vectors of your choosing (say `A` and `B`) on the same plot.

   (f) By adding additional arguments to the `plot` command, make one one of the plots a **dashed red line** and the other a **solid green line** to distinguish them. Additionally, using the `legend` command, add a legend to your plot to describe the lines.

`for` loops

9. (a) Create a Matlab *script* file called '`passWk10-loop.m`'.

   (b) Using a `for` loop, write Matlab script that outputs each element of a 1D vector to the command window. You may use the following template.

```
x = 1:10; % defining the vector, you can change this later

for % TODO: intialise the loop
   % TODO: complete the task
end
```