The University of Melbourne
ENGR30002 Fluid Mechanics

Workshop 01 – *Introduction: MATLAB*

Question 01

Enter the following commands in `MATLAB`

(1) `abs(3)`

(2) `abs(-5)`

(3) `abs(3-4i)`

what does the `abs` function do?

Question 02

Type in the following commands into `MATLAB`

(1) A=[1 2 3 4]

(2) B=[1; 2; 3; 4]

(3) C=[2 3 7 9 10 12 14]

(4) D=[2 3 3; 7 2 2]

Write down the outputs of the `length()` and `numel()` functions for each of the above input variables. Can you figure out what is the role of the `length()` and `numel()` functions in `MATLAB`?

(5) $A(4)$

(6) $A + B$

(7) $D(2, :)$

(8) $A\hat{}2$

(9) $C.\hat{}2$

(10) $C($`length(A)`$)$

Question 03

The matrices A and B are defined as follows:

$$A = \begin{bmatrix} 2 & 5 & 4 \\ 9 & 8 & 9 \\ 9 & 2 & 8 \end{bmatrix}$$

$$B = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 9 & 7 \\ 1 & 7 & 4 \end{bmatrix}$$

(1) $A + B$

(2) $A - B$

(3) A^T and B^T

(4) AB

(5) BA

(6) det(A) and det(B)

(7) A^{-1} and B^{-1}

Question 04

Three forces ($F1, F2, F3$) are acting on a point as shown in Figure 1. The forces are acting at angles to the horizontal: $\alpha = 45°$, β=30°, and θ= 40°. The forces are in equilibrium so the object remains static. It is also known that the magnitude of the three forces adds up to 150 N.

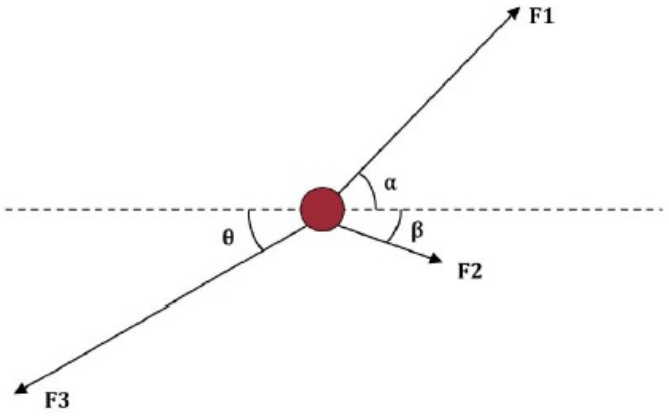

Figure 1: Force systems

(1) Write down a set of 3 simultaneous equations that describes the three forces above. *Hint: 2 of these equations can be derived by considering force balances.*

(2) Recast the equations in (1) into matrix/vector form (i.e. $Ax = b$, where x is the column vector of unknown forces $[F1, F2, F3]^T$.

(3) Code the relevant matrices/vectors (A and b) into `MATLAB`.

(4) Now we will use **MATLAB** to solve the system of equations for x:

   (a) One method would be to realise that $x = A^{-1}b$. You could use **MATLAB** to calculate the inverse matrix of A and ultimately calculate x.

   (b) A much simpler method is to use the syntax $A \setminus b$ to solve for x.

There is no one right answer, but some methods are typically more efficient than others. We stress getting the right outputs by any method regardless of efficiency. As you become more proficient in **MATLAB**, you will naturally tend towards more efficient methods of programming.

END OF WORKSHOP