

For this assignment, you should paste your MATLAB command window input/output into a Word document as before. Augment your MATLAB output to clearly indicate where one problem begins and the next one begins. For the written parts, you can type these into your Word document or write them neatly by hand.

- 1) (2 pts) Define the following variables:

$$a = 1 + 2i; \quad b = -1 + 2i.$$

Perform the following computations in MATLAB and verify the results by hand.

- a)  $a^2$   
 b)  $a*b$
- 2) (3 pts) Give the command that will create a row vector from -1 to 1 in steps of 0.1 and store it in the variable  $x$ . What are the dimensions of  $x$  (hint: use the `size` command)?

Use MATLAB to compute the quantities below and *explain the results you obtain*; for example, the explanation of part a) below is that the command extracts the first 11 elements of  $x$ . If you encounter an error, explain why the error occurs.

- a)  $x(1:11)$   
 b)  $x(0:22)$   
 c)  $x(1:2:21)$   
 d)  $x(21:-1:10)$   
 e)  $x(1:.1:2)$
- 3) (5 pts) Create the matrix

$$A = \begin{pmatrix} 2 & 4 & 6 \\ 3 & 6 & 9 \\ 4 & 8 & 12 \end{pmatrix}.$$

Use MATLAB to compute the quantities below and explain the results you obtain. If you encounter an error, explain why the error occurs.

- a)  $A(:,2)$   
 b)  $A(:,1:2:3)$   
 c)  $A(1,:)$   
 d)  $A(1:2,2:3)$   
 e)  $A'$

Define  $ii = [3 \ 1]$  and  $jj = [3 \ 2]$ . Explain the output of

- f)  $A(:,jj)$   
 g)  $A(ii,:)$   
 h)  $A(ii,jj)$

- 4) (4 pts) Create the following vectors in MATLAB:

$$w = \begin{pmatrix} 4 \\ 2 \\ 1 \end{pmatrix}; \quad x = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}; \quad y = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}.$$

Can the following operations be performed? If yes, give the result from MATLAB and verify by hand computation. If not, completely explain why not.

- a)  $x * w$

- b) `w' * w`
- c) `y .* w`
- d) `x ./ y`

5) (3 pts) Let  $y$  be defined as in Problem 4). Perform the following calculations in MATLAB and verify the results by hand:

- a) `t = y.^3`
- b) `r = sqrt(y.*y)`
- c) `s = norm(y)`

6) (4 pts) Let  $D$  be the matrix

$$D = \begin{pmatrix} 2 & -3 \\ 1 & -2 \end{pmatrix}.$$

Perform the following calculations in MATLAB and verify by hand.

- a) `C1 = D^2`
- b) `C2 = D.^2`

Clearly explain the difference in these 2 calculations.

7) (2 pts) Suppose  $x$  is a column vector of length 100. Write a single MATLAB command that will produce the vector

$$y = \begin{pmatrix} x(1) + x(2) \\ x(3) + x(4) \\ \vdots \\ x(99) + x(100) \end{pmatrix}$$

HINT: Think of  $y$  as the sum of the two vectors

$$y = \begin{pmatrix} x(1) \\ x(3) \\ \vdots \\ x(99) \end{pmatrix} + \begin{pmatrix} x(2) \\ x(4) \\ \vdots \\ x(100) \end{pmatrix}.$$

How can you use array indices to create these two vectors?