

Lab 1

Command Line MATLAB

Due: Jan. 18

Objectives:

- Gain familiarity with the MATLAB environment
- Learn basic MATLAB syntax and matrix operations

Assignment:

1. Generating Arrays Manually

- Open a diary to capture your commands and the resulting output.
- For each part, enter a comment to label the part and enter a **one-line** command that will generate the array by manually typing each value.

a. 1 2 3 5 8 13 21

d. 1 2 3

b. 10

6 5 4

20

7 8 9

30

0 0 1

40

e. 1 0 0 0

c. 1 5 10

0 2 0 0

12 15 18

0 0 3 0

0 0 0 4

2. Generating Arrays Using the [] operator

- Open a diary to capture your commands and the resulting output.
- For each part, enter a comment to label the part and enter a **one-line** command that will generate the array using the `[start:increment:limit]` format.

Hint: The apostrophe operator, `'`, transposes a matrix (i.e. can convert a row to a column.)

a. 0 5 10 15 20 25 30

d. 10 9 8 7 6 5 4 3 2 1 0

b. 10

e. 10

20

8

30

6

40

4

c. 0 10 20 30 40 50 60 70 80 90

2

3. Accessing Arrays

- Enter the 5-by-6 array *data* shown below by typing the command given. Note that the apostrophe in the command performs a transpose of the 6-by-5 matrix created using the reshape function, resulting in a 5-by-6 matrix.
- Open a diary to capture your commands and the resulting output.
- For each part, enter a comment to label the part and enter a **one-line** command that will extract the requested values from the array.

Deliverable: diary of the session with the desired array displayed after each command.

```
>> data = reshape([1:1:30],6,5)'
data =
```

```

1  2  3  4  5  6
7  8  9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24
25 26 27 28 29 30
```

- a. 14
- b. 22
- c. 19 20 21 22 23 24
- d. 4
10
16
22
28
- e. 13 14 15 16 17 18
19 20 21 22 23 24
- f. 14 15 16 17
20 21 22 23
26 27 28 29

- g. 30 29 28 27 26 25
- h. 9 10 11
21 22 23
3 4 5
9 10 11
- i. 1 3 4
13 15 16
- j. 2 1 2 3 3 5
8 7 8 9 9 11

4. Vector Operations

Perform each calculation by creating and initializing all variables for an equation and then evaluating the equation with a single non-looping command using vectorization. Note that you will have to enter the equation according to MATLAB's notation, not exactly as they are shown below.

Hint: This problem requires the `.` operator to be used whenever arrays are being multiplied or divided element by element.

- a. The equation for horizontal distance traveled by a projectile is

$$d = \frac{v^2 \sin 2\theta}{g}$$

where v is velocity, θ is the angle from horizontal, d is distance, and g is the acceleration due to gravity. Calculate the distance traveled for

$$g = 32 \text{ ft/s}^2$$

$$v = 100 \text{ ft/s}$$

$$\theta = 5^\circ \text{ to } 85^\circ \text{ in increments of } 10^\circ$$

- b. The equation for wind chill, T_{WC} , is given by

$$T_{WC} = 35.74 + 0.6215T - 35.75v^{0.16} + 0.4275Tv^{0.16}$$

where T is the temperature in degrees Fahrenheit and wind speed v is in mi/h. Calculate the wind chills for

$$T = 27^\circ\text{F}$$

$$v = 0 \text{ mi/hr to } 20 \text{ mi/hr in increments of } 2 \text{ mi/hr}$$

- c. The equivalent capacitance for two capacitors in series is

$$C_{EQ} = \frac{C_1 C_2}{C_1 + C_2}$$

Where C_{EQ} is the equivalent capacitance and C_1 and C_2 are the capacitances of the two capacitors. Calculate the ten equivalent capacitances for the following arrays of values taken pairwise (i.e. using the first values from each array, then the second values from each array, and so on).

$$C_1 = 0.10 \text{ to } 0.01 \text{ decrementing by } 0.01$$

$$C_2 = \text{ten capacitances spaced equally from } 0.6 \text{ to } 0.06$$

Deliverables:

Upload an electronic copy of the deliverables to Canvas per the lab submission requirements. Please note: **ALL** deliverables must be present in the single PDF report. Also, if you make mistakes in MATLAB as you are recording the diaries, you are allowed to (i.e. PLEASE) go back and delete the mistakes leaving only the commands and outputs that worked correctly.

Scoring:

10 points – Compliance with Submission Guidelines

15 points – Diary of Part 1

15 points – Diary of Part 2

30 points – Diary of Part 3

30 points – Diary of Part 4