**ENED 1090: Engineering Models I**

**Homework Assignment #7**

**Due: Week of November 2nd at the beginning of your Recitation Section**

**Problem 1: Array Indexing**

For this problem, you will need to download the HW7.mat file from Blackboard. Drop it in your current MATLAB folder then type: load HW7 at the MATLAB command prompt. You should now have the following three variables (x, y, and M) in your workspace with the values shown below. Don’t make any modifications to these variables.

**x = 4 5 -1 5 3 -2 0 2 5 5 -1 5 5 3 4**

**y = -1 5 5 4 5 3 -2 4 5 3 4 3 1 3 -1**

M =

2 2 3 2 -4

-5 -2 7 3 0

-2 5 -3 -2 5

-5 -5 0 2 -2

-4 -1 -1 2 1

4 -1 2 -4 -3

***For all parts of this problem, don’t put a semicolon at the end of your command so you can copy the results as well as your MATLAB command.***

1. What MATLAB command will pull out entries 2 thru 6 in vector, x, and store them in a vector called a?

Command and Results:

x(2:6)

ans =

5 -1 5 3 -2

1. What MATLAB command will pull out every other entry of the vector, y, starting at entry 5 and store these entries in a vector called b? Command and Results:

y(5:2:15)

ans =

5 -2 5 4 1 -1

1. What MATLAB command will pull out the7 in matrix, M, and store it in a scalar variable called c?

Command and Results:

c = M(2,3)

c =

7

1. What MATLAB command will pull out row 4 of the matrix, M, and store these values in a row vector called d?

Command and Results:

d = M(2,:)

d =

-5 -2 7 3 0

1. What MATLAB command will pull out column 2 of the matrix, M, and store these values in a column vector called e?

Command and Results:

e = M(:,2)

e =

2

-2

5

-5

-1

-1

1. What MATLAB command will pull out the section of matrix, M, shown below and store these values in a matrix called f?

3 2 -4

7 3 0

-3 -2 5

Command and Results:

f = M(1:3 , 3:5)

f =

3 2 -4

7 3 0

-3 -2 5

**Problem 2: Functions for Creating Arrays (randi, rand, ones, zeros)**

***For all parts of this problem, don’t put a semicolon at the end of your command so you can copy the results.***

1. What MATLAB command will create a vector, a, that has 16 random integers with values that fall within the range [2 6]?

Command and Results:

**a = randi([-2,6] , [1,16])**

**a =**

**1 6 5 6 3 -2 5 6 4 4 4 1 3 -1 4 -2**

1. What MATLAB command will create a vector, b, that has 16 zeros in it?

Command and Results:

b = zeros(1,16)

ans =

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

1. What MATLAB command will create a vector, c, that has 25 fives in it?

Command (Don’t need to paste the results):

**c = 5\*ones(1,25)**

1. Use the ***rand*** command to create a vector, d, of 8 decimal numbers that fall in the range 2 to 6.

Command and Results:

**d = 2+4\*rand(1,8)**

**d =**

**3.1077 2.1847 2.3885 5.2938 4.7793 3.2684 5.8009 2.1378**

1. What MATLAB command will produce a 4x7 matrix, e, that has random integers with values that fall within the range [ 3 10 ]?

Command and Results:

e = randi([-3 10] , [4 7])

e =

3 -1 6 6 10 7 9

2 3 7 -1 1 0 10

7 3 0 -2 5 4 4

8 6 6 3 0 6 -2

**Problem 3: More Loop Practice**

For this problem, you will need the same x and y vectors from Problem 1. Create a script file and include the command: load HW7 in your script. Use a ***for loop*** to accomplish the following:

* Create a vector z that has entries with the maximum of x and y (i.e.. if x(k) exceeds y(k) then z(k) equals x(k) otherwise z(k) = y(k)). ***Display vector z after the for loop.***
* Count how many entries in vector x are greater than the corresponding entries in y. ***Display the count after the for loop.***
* Count how many entries in vector y are greater than the corresponding entries in x. ***Display the count after the for loop.***
* Create a vector, called Location, that stores the the entry values where x and y are equivalent. ***Display Location after the for loop.***

MATLAB Script and Results:

clear;clc;

load HW7

z = 1:length(x);

Location = [];

xcount = 0;

ycount = 0;

for k = 1:length(x)

if x(k) > y(k)

z(k) = x(k);

xcount = xcount + 1;

elseif y(k) > x(k)

z(k) = y(k);

ycount = ycount + 1;

else

Location(k) = x(k);

end

end

fprintf('The number of times x was greater than y was: %i\n', xcount);

fprintf('The number of times y was greater than x was: %i\n', ycount);

disp(Location)

**The number of times x was greater than y was: 7**

**The number of times y was greater than x was: 5**

**Location=**

**0 5 0 0 0 0 0 0 5 0 0 0 0 3**

**Problem 4: Plotting Data from a Matrix**

For this problem, you will need to download the excel file: Height posted on Blackboard. This file has projectile height data versus time for five different launch angles (25o, 35 o, 45 o, 55 o, and 65 o) assuming an initial velocity of 100 m/s.

Import the row of time values as a vector (1x191) into MATLAB using either xlsread or the import tool. Import the height data as a matrix (5x191) into MATLAB using either xlsread or the import tool.

1. At the MATLAB command prompt, type a MATLAB command that will display the first six columns in your height matrix.

Command and Results:

height(:,1:6)

ans =

0 4.1771 8.2562 12.2371 16.1199 19.9047

0 5.6867 11.2753 16.7658 22.1583 27.4526

0 7.0220 13.9459 20.7718 27.4995 34.1291

0 8.1425 16.1868 24.1331 31.9813 39.7314

0 9.0140 17.9300 26.7478 35.4675 44.0891

1. Plot time on the x-axis and height on the y-axis for all five angles. Add a legend showing each launch angle. Add labels **(include units)** and a title.

MATLAB Commands and Plot:

clear;clc;

time = xlsread('Height.xlsx', 'B1:GJ1');

h = xlsread('Height.xlsx', 'B4:GJ8');

a25 = h(1,:);

a35 = h(2,:);

a45 = h(3,:);

a55 = h(4,:);

a65 = h(5,:);

plot(time, a25,time, a35,time, a45,time, a55,time, a65)

xlabel('Time (sec)')

ylabel('Height (meters)')

title('Height vs. Time')

legend('25°','35°','45°','55°','65°')

