**ME 190 Lab 1- MatLab Refresher and Data Handling**

**Table of Contents**

[Summary](#_bookmark0) [1](#_bookmark0)

[Exercise 1 - Matrix Generation and Manipulation](#_bookmark1) [1](#_bookmark1)

[Exercise 2 - Simple Indexing](#_bookmark2) [2](#_bookmark2)

[Exercise 3 - Multiplication Table](#_bookmark3) [4](#_bookmark3)

[Part A - Times Table](#_bookmark4) [4](#_bookmark4)

[Part - B](#_bookmark5) [5](#_bookmark5)

[Part - C](#_bookmark6) [7](#_bookmark6)

[Problem 4](#_bookmark7) [11](#_bookmark7)

[Problem 5](#_bookmark8) [12](#_bookmark8)

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# Summary

In this lab my partner and I learned to use the bbasic functions of MatLab to create vectors and matrices and manipulate their contents. We also used the linspace and logspace commands to create large vectors with regular spacing. This lab was also an opportunity to learn how to create basic scripts and generating a lab report using the publish feature. My partner and I also learned how to read in data from Microsoft Excel and how to plot data and create graphs that overlapped and had different line representations. In order to accomplish the tasks, we used the handouts that were referred to in the lab manual as well as the resources provided by MatLab online to correctly enter commands into the console. I am happy with the instruction provided by this lab and learned how to use the basic elements of MatLab. The power of the software makes me want to learn more.

%--------------------------------------------------------------------------

# Exercise 1 - Matrix Generation and Manipula- tion

B = 5:13

C = 13:-1:5 D = B.\*C

E = [B(1:3),C(4:6),D(7:9)]

F = [B(1:3);C(4:6);D(7:9)]

G = [linspace(10,100,10);logspace(1,2,10)]

%--------------------------------------------------------------------------

*B =*

*5 6 7 8 9 10 11 12 13*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *C* | *=* | *13* | *12* | *11* | *10* | *9* | *8* | *7* | *6* | *5* | |
| *D* | *=* |  |  |  |  |  |  |  |  |  | |
|  |  | *65* | *72* | *77* | *80* | *81* | *80* | *77* | *72* | *65* | |
| *E* | *=* |  |  |  |  |  |  |  |  |  | |
|  |  | *5* | *6* | *7* | *10* | *9* | *8* | *77* | *72* | *65* | |
| *F* | *=* |  |  |  |  |  |  |  |  |  | |
|  |  | *5* | *6* | *7* |  |  |  |  |  |  | |
|  |  | *10* | *9* | *8* |  |  |  |  |  |  | |
|  |  | *77* | *72* | *65* |  |  |  |  |  |  | |
| *G* | *=* |  |  |  |  |  |  |  |  |  | |
|  | *Columns 1* | | | *through 7* |  | |  |  | |  |  |
|  | *10.0000* | | | *20.0000* | *30.0000* | | *40.0000* | *50.0000* | | *60.0000* | *70.0000* |
|  | *10.0000* | | | *12.9155* | *16.6810* | | *21.5443* | *27.8256* | | *35.9381* | *46.4159* |
|  | *Columns 8* | | | *through 10* |  | |  |  | |  |  |

*80.0000 90.0000 100.0000*

*59.9484 77.4264 100.0000*

# Exercise 2 - Simple Indexing

x = -100:100;

y = x.^3 + 60\*x.^2 -50;

miny = min(y) maxy = max(y)

negmaxy = max(y(y<0)) posminy = min(y(y>0))

indexnegmaxy = find(y== -50) indexposminy = find(y == 9)

firstindexpos = find(y > 0,1) firstposy = y(42)

yzero2thousand = find(y>0 & y<1000) valyzero2thousand = y(yzero2thousand)

%--------------------------------------------------------------------------

*miny =*

*-400050*

*maxy =*

*1599950*

*negmaxy =*

*-50*

*posminy =*

*9*

*indexnegmaxy = 41 101*

*indexposminy = 100*

*firstindexpos = 42*

*firstposy =*

*3431*

*yzero2thousand =*

*97 98 99 100 102 103 104 105*

*valyzero2thousand =*

*846 463 182 9 11 198 517 974*

**Exercise 3 - Multiplication Table** **Part A - Times Table**

table size

row=5 col=5

x2 = 1:col

y2 = (1:row)' z = y2\*x2

% generate table and output table = z

zmiddle = z(2:end-1,2:end-1) zvector = zmiddle(:)

zsum = sum(zvector)

*row =*

*5*

*col =*

*5*

*x2 =*

*1 2 3 4 5*

*y2 =*

*1*

*2*

*3*

*4*

*5*

*z =*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *1* | *2* | *3* | *4* | *5* |
| *2* | *4* | *6* | *8* | *10* |
| *3* | *6* | *9* | *12* | *15* |
| *4* | *8* | *12* | *16* | *20* |

*5 10 15 20 25*

*table =*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *1* | *2* | *3* | *4* | *5* |
| *2* | *4* | *6* | *8* | *10* |
| *3* | *6* | *9* | *12* | *15* |
| *4* | *8* | *12* | *16* | *20* |
| *5* | *10* | *15* | *20* | *25* |

*zmiddle =*

|  |  |  |
| --- | --- | --- |
| *4* | *6* | *8* |
| *6* | *9* | *12* |
| *8* | *12* | *16* |

*zvector =*

*4*

*6*

*8*

*6*

*9*

*12*

*8*

*12*

*16*

*zsum =*

*81*

# Part - B

row2 = 6

col2 = 7

x3 = 1:col2

y3 = (1:row2)' z2 = y3\*x3

table67 = z2

zmiddle2 = z2(2:end-1,2:end-1) zvector67 = zmiddle2(:)

zsum67 = sum(zvector67)

*row2 =*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *col2* | *6*  *=* |  | | | | | |
|  | *7* |
| *x3 =* |  |
|  | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| *y3 =* |  |  |  |  |  |  |  |
|  | *1* |  |  |  |  |  |  |
|  | *2* |  |  |  |  |  |  |
|  | *3* |  |  |  |  |  |  |
|  | *4* |  |  |  |  |  |  |
|  | *5* |  |  |  |  |  |  |
|  | *6* |  |  |  |  |  |  |
| *z2 =* |  |  |  |  |  |  |  |
|  | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
|  | *2* | *4* | *6* | *8* | *10* | *12* | *14* |
|  | *3* | *6* | *9* | *12* | *15* | *18* | *21* |
|  | *4* | *8* | *12* | *16* | *20* | *24* | *28* |
|  | *5* | *10* | *15* | *20* | *25* | *30* | *35* |
|  | *6* | *12* | *18* | *24* | *30* | *36* | *42* |

*table67 =*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| *2* | *4* | *6* | *8* | *10* | *12* | *14* |
| *3* | *6* | *9* | *12* | *15* | *18* | *21* |
| *4* | *8* | *12* | *16* | *20* | *24* | *28* |
| *5* | *10* | *15* | *20* | *25* | *30* | *35* |
| *6* | *12* | *18* | *24* | *30* | *36* | *42* |

*zmiddle2 =*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *4* | *6* | *8* | *10* | *12* |
| *6* | *9* | *12* | *15* | *18* |
| *8* | *12* | *16* | *20* | *24* |
| *10* | *15* | *20* | *25* | *30* |

*zvector67 =*

*4*

*6*

*8*

*10*

*6*

*9*

*12*

*15*

*8*

*12*

*16*

*20*

*10*

*15*

*20*

*25*

*12*

*18*

*24*

*30*

*zsum67 = 280*

# Part - C

row3 = 10

col3 = 10

x4 = 1:col3

y4 = (1:row3)' z3 = y4\*x4

table10 = z3

vector10x10 = table10(:)

vector10x10 = find(vector10x10 > 20 & vector10x10 < 70) size(vector10x10)

%--------------------------------------------------------------------------

*row3 =*

*10*

*col3 =*

*10*

*x4 =*

*1 2 3 4 5 6 7 8 9 10*

*y4 =*

*1*

*2*

*3*

*4*

*5*

*6*

*7*

*8*

*9*

*10*

*z3 =*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
| *2* | *4* | *6* | *8* | *10* | *12* | *14* | *16* | *18* | *20* |
| *3* | *6* | *9* | *12* | *15* | *18* | *21* | *24* | *27* | *30* |
| *4* | *8* | *12* | *16* | *20* | *24* | *28* | *32* | *36* | *40* |
| *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* | *45* | *50* |
| *6* | *12* | *18* | *24* | *30* | *36* | *42* | *48* | *54* | *60* |
| *7* | *14* | *21* | *28* | *35* | *42* | *49* | *56* | *63* | *70* |
| *8* | *16* | *24* | *32* | *40* | *48* | *56* | *64* | *72* | *80* |
| *9* | *18* | *27* | *36* | *45* | *54* | *63* | *72* | *81* | *90* |
| *10* | *20* | *30* | *40* | *50* | *60* | *70* | *80* | *90* | *100* |

*table10 =*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
| *2* | *4* | *6* | *8* | *10* | *12* | *14* | *16* | *18* | *20* |
| *3* | *6* | *9* | *12* | *15* | *18* | *21* | *24* | *27* | *30* |
| *4* | *8* | *12* | *16* | *20* | *24* | *28* | *32* | *36* | *40* |
| *5* | *10* | *15* | *20* | *25* | *30* | *35* | *40* | *45* | *50* |
| *6* | *12* | *18* | *24* | *30* | *36* | *42* | *48* | *54* | *60* |
| *7* | *14* | *21* | *28* | *35* | *42* | *49* | *56* | *63* | *70* |
| *8* | *16* | *24* | *32* | *40* | *48* | *56* | *64* | *72* | *80* |
| *9* | *18* | *27* | *36* | *45* | *54* | *63* | *72* | *81* | *90* |
| *10* | *20* | *30* | *40* | *50* | *60* | *70* | *80* | *90* | *100* |

*vector10x10 =*

*1*

*2*

*3*

*4*

*5*

*6*

*7*

*8*

*9*

*10*

*2*

*4*

*6*

*8*

*10*

*12*

*14*

*16*

*18*

*20*

*3*

*6*

*9*

*12*

*15*

*18*

*21*

*24*

*27*

*30*

*4*

*8*

*12*

*16*

*20*

*24*

*28*

*32*

*36*

*40*

*5*

*10*

*15*

*20*

*25*

*30*

*35*

*40*

*45*

*50*

*6*

*12*

*18*

*24*

*30*

*36*

*42*

*48*

*54*

*60*

*7*

*14*

*21*

*28*

*35*

*42*

*49*

*56*

*63*

*70*

*8*

*16*

*24*

*32*

*40*

*48*

*56*

*64*

*72*

*80*

*9*

*18*

*27*

*36*

*45*

*54*

*63*

*72*

*81*

*90*

*10*

*20*

*30*

*40*

*50*

*60*

*70*

*80*

*90*

*100*

*vector10x10 =*

*27*

*28*

*29*

*30*

*36*

*37*

*38*

*39*

*40*

*45*

*46*

*47*

*48*

*49*

*50*

*54*

*55*

*56*

*57*

*58*

*59*

*60*

*63*

*64*

*65*

*66*

*67*

*68*

*69*

*73*

*74*

*75*

*76*

*77*

*78*

*83*

*84*

*85*

*86*

*87*

*93*

*94*

*95*

*96*

*ans =*

*44 1*

# Problem 4

A = xlsread('Lab1Excel.xlsx'); figure(1);

ax1 = subplot(2,1,1);

sin = plot(A(:,1),A(:,2),'b','LineWidth',2); hold on;

cos = plot(A(:,1),A(:,3),'--r','LineWidth',2); title('Sine and Cosine');

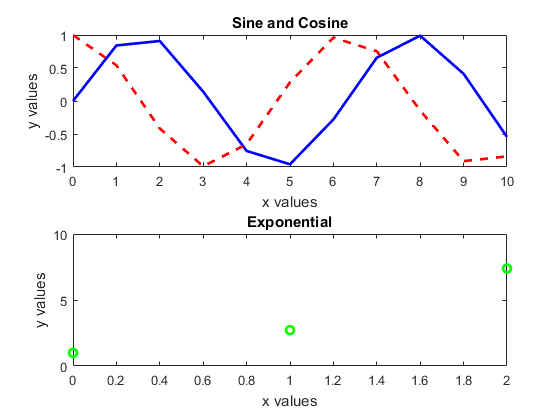
xlabel('x values');

ylabel('y values'); ax2 = subplot(2,1,2);

exp = plot(A(:,1),A(:,4),'og','LineWidth',2); axis(ax2,[0 2 0 10]);

title('Exponential'); xlabel('x values'); ylabel('y values');

%--------------------------------------------------------------------------



# Problem 5

A = xlsread('Lab1Excel.xlsx'); figure(2);

sin2 = plot(A(:,1),A(:,2),'b','LineWidth',2); axis(sin2, [0 10 -1 1]);

% 6th order polynomial is the lowest polynomial order that provides a

% reasonable fit

*Error using message*

*In 'MATLAB:axis:UnknownOption', data type supplied is incorrect for parameter {1}.*

*Error in axis (line 204)*

*error(message('MATLAB:axis:UnknownOption', cur\_arg)); Error in lab\_1 (line 122)*

*axis(sin2, [0 10 -1 1]);*

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