Jonah Spector

Lab: 2

Lab Section: 001

MATLAB Introduction II

# Introduction:

Continuing with MATLAB, we learned more about the official software, including the m-file editor and common terminal commands, plotting, Cramer’s rule, and applied these new ideas to the given problems. All these skills are valuable for the MATLAB use-cases described in the previous lab.

# Question 1:

## Results:

## Code:

% a

A = 1:10;

for n=1:10

A(n) = log(A(n));

end

% b

B = 1:10;

for n=1:10

B(n) = 2\*n - 1;

end

% c

C = 1:10;

for n=1:10

C(n) = sqrt(2\*n);

end

% d

subplot(2,2,1)

plot(A, ".")

title("log()")

grid on

subplot(2,2,2)

plot(B, ".")

title("odd")

grid on

subplot(2,2,3)

plot(C, ".")

title("sqrt(even)")

grid on

subplot(2,2,4)

plot(A, ".")

hold on

plot(B, "^")

plot(C, "\*")

title("All together")

legend("log()","odd","sqrt(even)")

grid on

hold off

## Comments:

All three for loops worked correctly. Each subplot displayed currently. The odd numbers grow faster than the square root of the even numbers which grows faster than log.

# Questions 2:

## Results:



## Code:

img\_num = 1:360;

for i=1:360

img\_num(i)=exp(2\*pi\*i\*1i/360);

end

plot(img\_num)

title("e^{i\theta}")

ylabel("Img")

xlabel("Real")

grid on

## Comments:

The figure shows the complex unit circle generated from Euler’s formula. The values don’t overlap since theta ranges from around 0 radians to 2 pi radians.

# Question 3:

## Results:

The matrix produced by the code is:

2 3 4 5 6 7 8 9 10 11

3 4 5 6 7 8 9 10 11 12

4 5 6 7 8 9 10 11 12 13

5 6 7 8 9 10 11 12 13 14

6 7 8 9 10 11 12 13 14 15

7 8 9 10 11 12 13 14 15 16

8 9 10 11 12 13 14 15 16 17

9 10 11 12 13 14 15 16 17 18

10 11 12 13 14 15 16 17 18 19

11 12 13 14 15 16 17 18 19 20

## Code:

nested\_mat = zeros(10);

for i=1:10

for k=1:10

nested\_mat(i,k)=i+k;

end

end

## Comments:

The matrix of indices sums was correctly produced by the nested for loop.

# Question 4:

## Results:

*x = 4.88, y = -2.37, z = 0.4228, w = -1.86.*

## Code:

A = [1 6 -12 3;

1 -3 0 0;

-3 -14 0 10;

6 3 5 5];

b = [-20; 12; 0; 15];

Ax = A; Ay = A; Az = A; Aw = A;

Ax(:,1) = b;

Ay(:,2) = b;

Az(:,3) = b;

Aw(:,4) = b;

detA = det(A);

cramer\_x = det(Ax)/detA;

cramer\_y = det(Ay)/detA;

cramer\_z = det(Az)/detA;

cramer\_w = det(Aw)/detA;

## Comments:

Cramer’s rule as implement in the code and with the coefficient matrix A and values b correctly solved the system of linear equations.

# Question 5:

## Results:

*x = 4.88, y = -2.37, z = 0.4228, w = -1.86.*

## Code:

A = [1 6 -12 3;

1 -3 0 0;

-3 -14 0 10;

6 3 5 5];

b = [-20; 12; 0; 15];

x = inv(A) \* b; % [x, y, z, w]

## Comments:

Multiplying b by the inverse of A is equivalent to Cramer’s rule and correctly find the values of x, y, z, and w.

# Conclusion:

Through these exercises, I learned more complex plotting methods, for loops, solving systems of linear equations, Cramer’s rule, and the MATLAB editor, including both the terminal and m-file editor. It should be noted that I have already taken CBE 160, MATLAB for Chemical and Biological Engineers, so I am already familiar with MATLAB.