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Lab: 2
Lab Section: 001

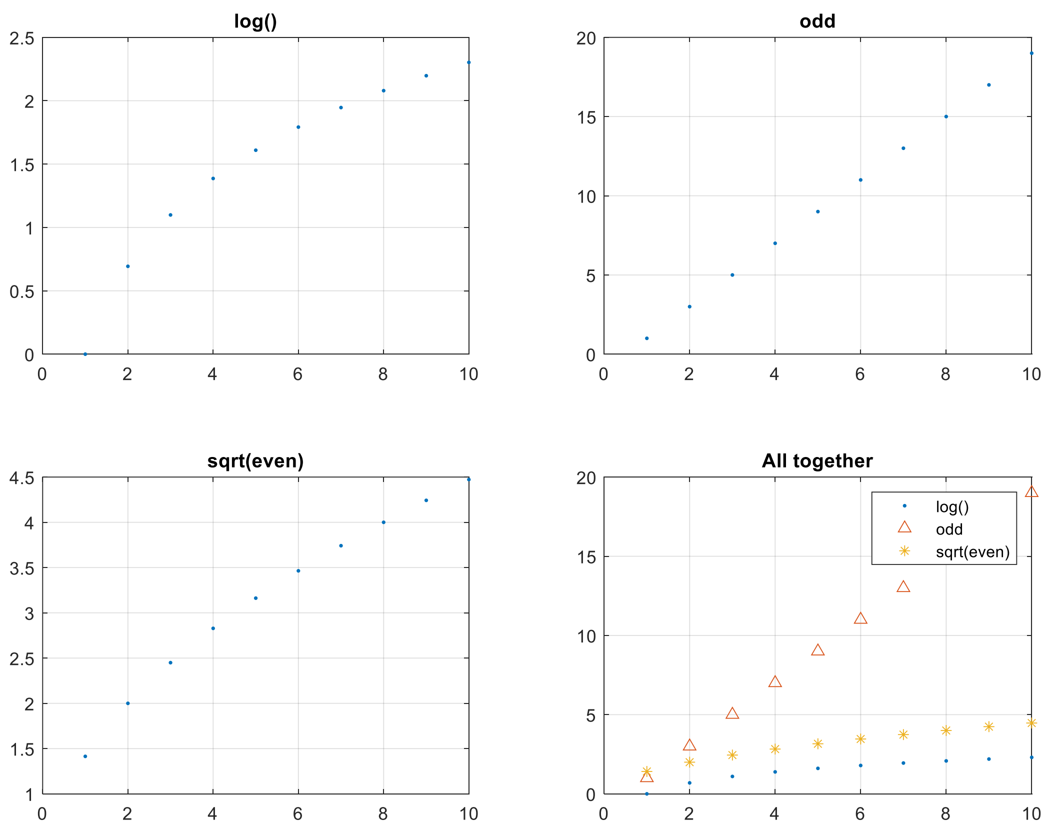
MATLAB Introduction II

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;
```

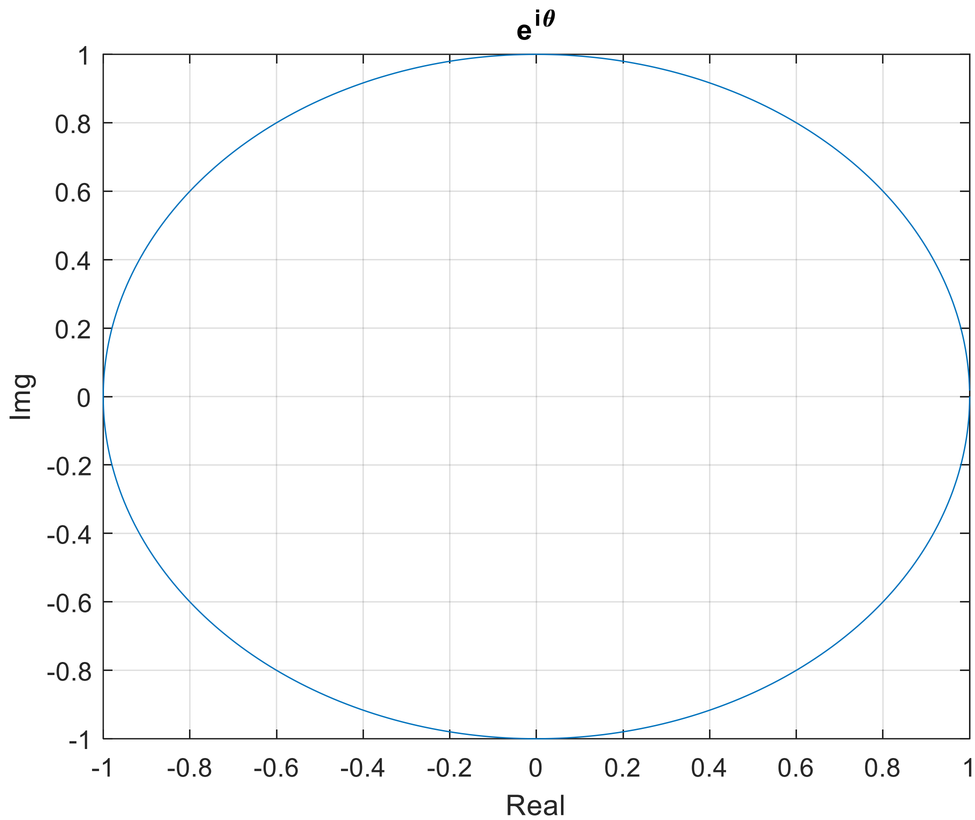
```
for n=1:10
    B(n) = 2*n - 1;
end

% 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.