Contents


```
%Tyler Matthews
%System Simluation Midterm P4
clc; close all; %Clear console and close figures
```

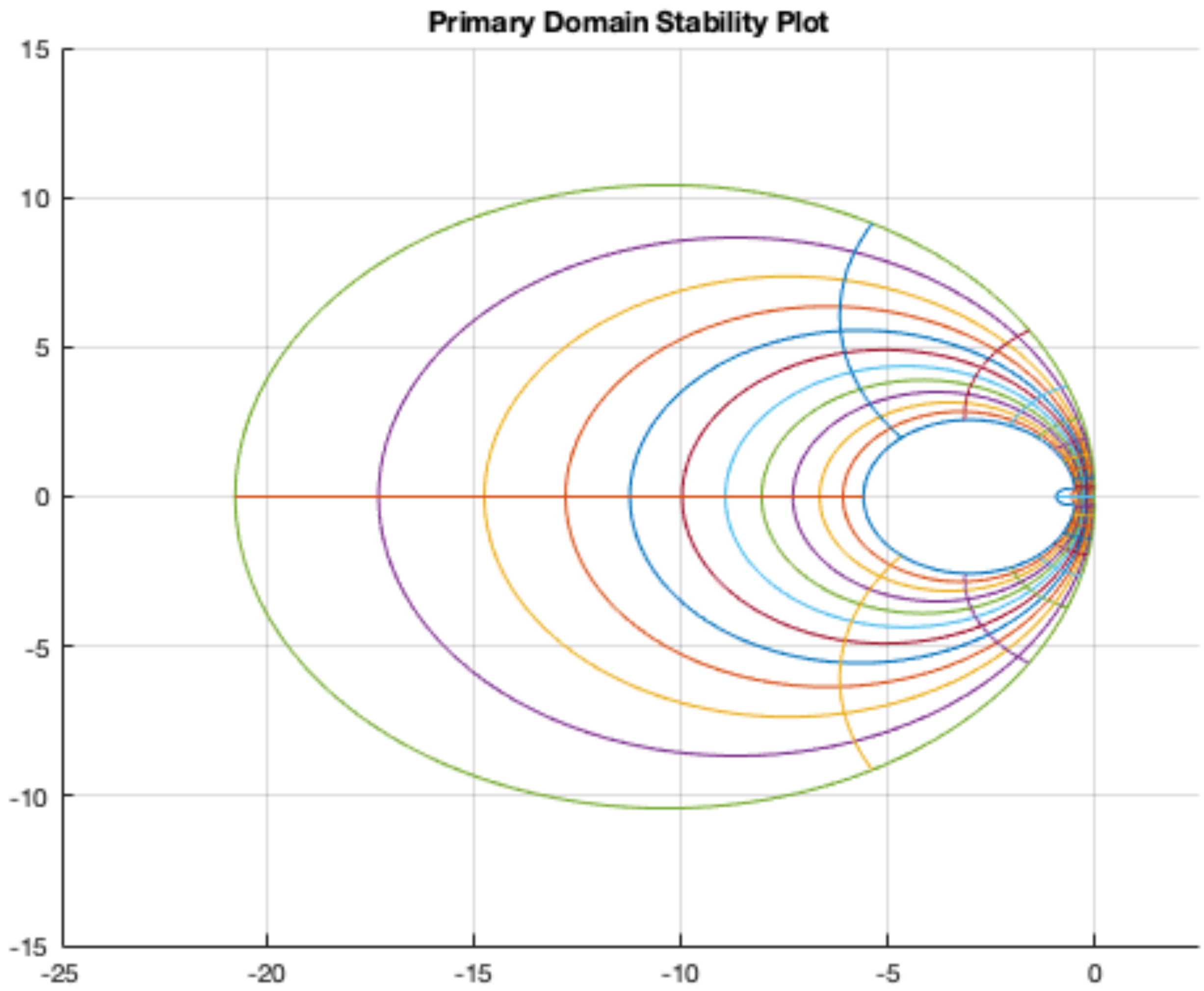
PART C

```
Nt=21;
Nr=12;

num = [0.46 0.29 -0.32]
den = [1 -1.56 0.56]

Hp = tf(num, den)
zeros = roots(num)
poles = roots(den)

Phi = tf(den, num) %(sigma / roe) : (row - 1*sigma)

newNum = [10076 -11552 3368]
badPoints = roots(newNum)
magnitude = abs(badPoints)

theta=linspace(0,2*pi,1001);
rho=linspace(0.595,1,1001);
tvec=linspace(0,2*pi,Nt);
rvec=linspace(0.595,1,Nr);

temp = (roots(den - num*0.5764));
mag = abs(temp)
ang = angle(temp)

for k=1:length(rvec)
 z=rvec(k)*exp(i*theta);
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w))
 hold off
end

for k=1:length(tvec)-1
 z=rho*exp(i*tvec(k));
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w))
 hold off
end
```

```
grid on
axis([-25 2.5 -15 15])
title('Primary Domain Stability Plot')

%TESTING FOR INTERSECTION POINT
% for N=1:10
%     temp =  0.579 - N*0.0001
%     val = sprintf('N = %0.5f',temp);
%     z = (temp) * exp(i*theta);
%     w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
%     plot(real(w), imag(w));
%     title(val);
%     disp(val);
%     disp(w(1));
%     disp(w(2));
%     pause;
% end
```

```
num =

    0.4600    0.2900   -0.3200


den =

    1.0000   -1.5600    0.5600


Hp =

  0.46 s^2 + 0.29 s - 0.32
  ------------------------
    s^2 - 1.56 s + 0.56

Continuous-time transfer function.


zeros =

   -1.2069
    0.5764


poles =

    1.0000
    0.5600


Phi =

    s^2 - 1.56 s + 0.56
  ------------------------
  0.46 s^2 + 0.29 s - 0.32
```

```
Continuous-time transfer function.


newNum =

       10076      -11552        3368


badPoints =

   0.5732 + 0.0752i
   0.5732 - 0.0752i


magnitude =

    0.5782
    0.5782


mag =

    1.7818
    0.5686


ang =

     0
     0
```



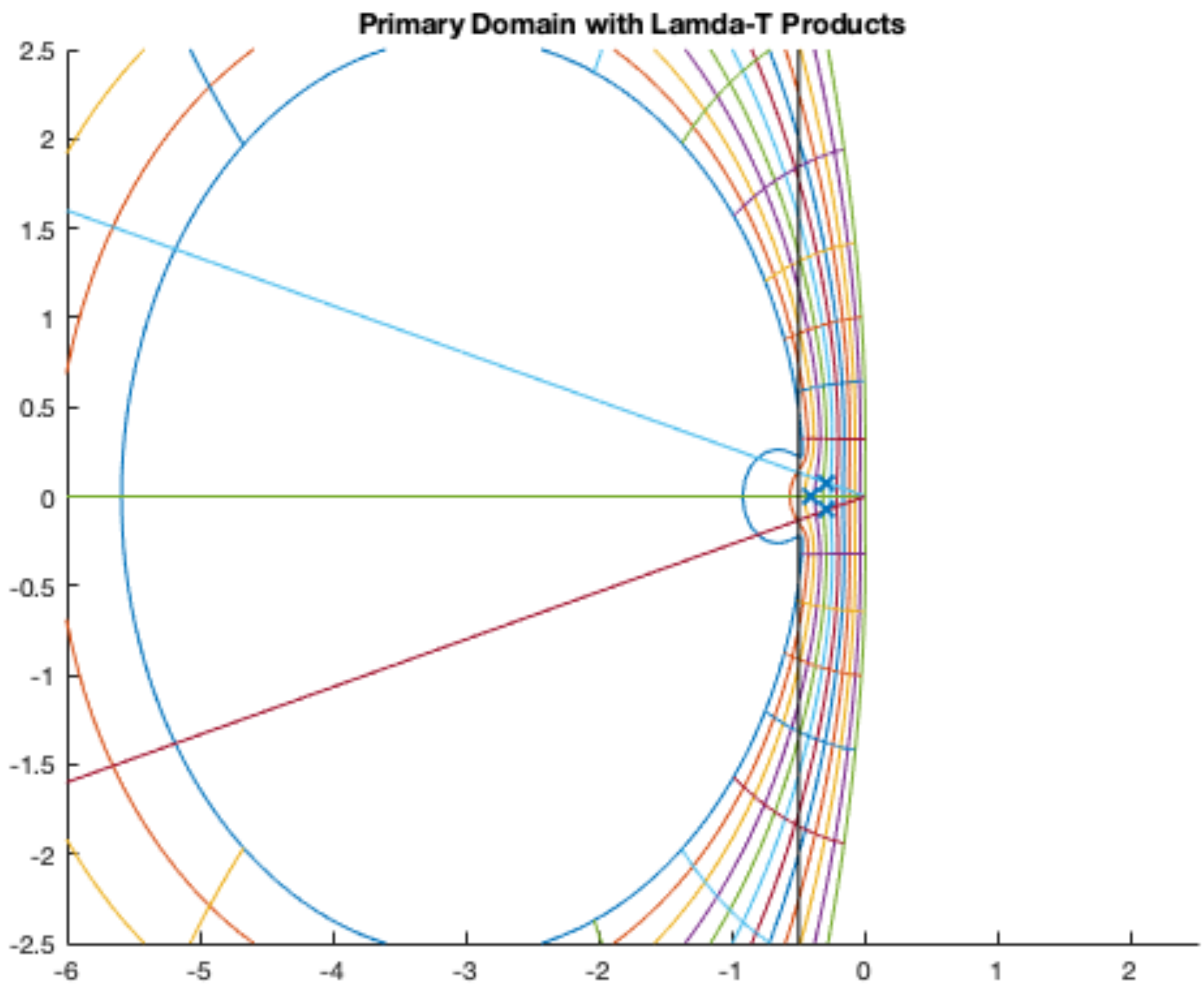
PART D

```
%Getting an actual value for T using the state-space representation in
%problem 03

A = [-4.7, -1.55, -0.55; 0.3, -2.75, -0.35; 1.1, 1.85, -2.55]
B = [1; 0; -1]
C = [2, 1, 1]
D = [0]

lamda = eig(A)

figure;

for k=1:length(rvec)
 z=rvec(k)*exp(i*theta);
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w))
 hold off
end

for k=1:length(tvec)-1
 z=rho*exp(i*tvec(k));
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w))
 hold off
end
```

```
axis([-6 2.5 -2.5 2.5])
title('Primary Domain with Lamda-T Products')
T = linspace(0,2,1001);

hold on
plot(real(lamda(1)*T), imag(lamda(1)*T))
plot(real(lamda(2)*T), imag(lamda(2)*T))
plot(real(lamda(3)*T), imag(lamda(3)*T))
hold off

disp('Stable, and accurate, values for T would be located inside of the green incompassing lin
e and to the right of the black line in Figure 2')
disp("Using lamda-T products from Problem 3, this would give us T = 0.1 -> Shown by the 'x's o
n Figure 2")

stable_acc = 0.1;

hold on
    plot([-0.5 -0.5], [-20 20], 'black')
hold off

hold on
    plot(real(stable_acc * lamda), imag(stable_acc * lamda), 'x')
hold off
```

```
A =

   -4.7000   -1.5500   -0.5500
    0.3000   -2.7500   -0.3500
    1.1000    1.8500   -2.5500


B =

     1
     0
    -1


C =

     2     1     1


D =

     0


lamda =

  -4.0000 + 0.0000i
  -3.0000 + 0.8000i
  -3.0000 - 0.8000i
```

```
Stable, and accurate, values for T would be located inside of the green incompassing line and
to the right of the black line in Figure 2
Using lamda-T products from Problem 3, this would give us T = 0.1 -> Shown by the 'x's on Figu
re 2
```

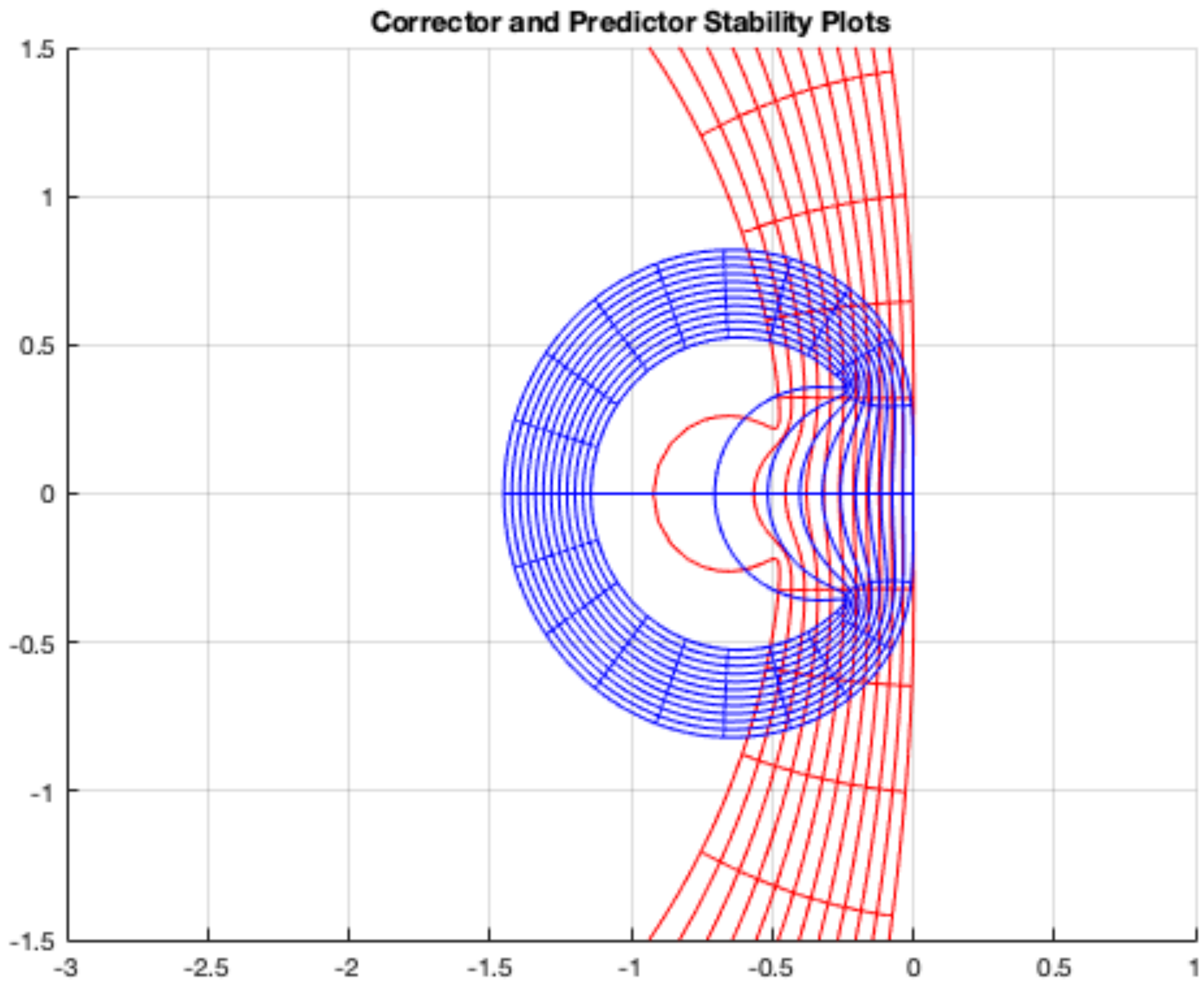


PART E

```
figure;

%Corrector Plot
for k=1:length(rvec)
 z=rvec(k)*exp(i*theta);
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w), 'r')
 hold off
end

for k=1:length(tvec)-1
 z=rho*exp(i*tvec(k));
 w = (z.^2-z.*1.56 + 0.56)./(z.^2.*0.46+z.*0.29-0.32);
 hold on
 plot(real(w), imag(w), 'r')
 hold off
end

theta=linspace(0,2*pi,1001);
```

```
rho=linspace(0.6192,1,1001);
tvec=linspace(0,2*pi,Nt);
rvec=linspace(0.6192,1,Nr);

%Predictor Plot
for k=1:length(rvec)
 z=rvec(k)*exp(i*theta);
 w=(z.^2-z.*1.45 + 0.45)./(z.*1.27-0.73);

 hold on
 plot(real(w), imag(w), 'b')
 hold off
end

for k=1:length(tvec)-1
 z=rho*exp(i*tvec(k));
 w=(z.^2-z.*1.45 + 0.45)./(z.*1.27-0.73);
 hold on
 plot(real(w), imag(w), 'b')
 hold off
end


grid on
axis([-3 1 -1.5 1.5])
title('Corrector and Predictor Stability Plots')

disp(' ')
disp('Stability plot for the predictor is in blue and the stability plot for corrector is in r
ed')
disp('You can see that the plots are similiar, but the corrector plot is much larger')
```

```
Stability plot for the predictor is in blue and the stability plot for corrector is in red
You can see that the plots are similiar, but the corrector plot is much larger
```



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