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Lab 1 Jesse Layman SID: 861135479

```
% Professor: Ertem Tuncel,
% TA: Ceren Sevinc,
% EE141-022
```

Problem 1

```
%a)
z1_a = roots([2  16 34 20  0])
p1_a = roots([1 -10 35 -50 24])
g1_a = 2/1

G1_a = zpk(z1_a,p1_a,g1_a)

%b)
z1_b = roots([10 -21 14 -3])
p1_b = roots([3   -3 -6  0])
g1_b = 10/3
G1_b = zpk(z1_b,p1_b,g1_b)

%c)
z1_c = roots([1 0 0 0 -1 0 0 0 0])
p1_c = roots([1 0 0 0 0 0 0 0 -1])
g1_c = 1/1
G1_c = zpk(z1_c,p1_c,g1_c)

z1_a =
          0
   -5.0000
   -2.0000
   -1.0000
p1_a =
    4.0000
    3.0000
    2.0000
    1.0000
g1_a =
     2

G1_a =
```

```
   2 s (s+5) (s+2) (s+1)
  -----------------------
  (s-4) (s-3) (s-2) (s-1)

Continuous-time zero/pole/gain model.

z1_b =
    1.0000
    0.6000
    0.5000
p1_b =
     0
     2
    -1
g1_b =
    3.3333

G1_b =

  3.3333 (s-1) (s-0.6) (s-0.5)
  ----------------------------
         s (s-2) (s+1)

Continuous-time zero/pole/gain model.

z1_c =
   0.0000 + 0.0000i
   0.0000 + 0.0000i
   0.0000 + 0.0000i
   0.0000 + 0.0000i
  -1.0000 + 0.0000i
   0.0000 + 1.0000i
   0.0000 - 1.0000i
   1.0000 + 0.0000i
p1_c =
  -1.0000 + 0.0000i
  -0.7071 + 0.7071i
  -0.7071 - 0.7071i
   0.0000 + 1.0000i
   0.0000 - 1.0000i
   1.0000 + 0.0000i
   0.7071 + 0.7071i
   0.7071 - 0.7071i
g1_c =
     1

G1_c =

                   s^4 (s+1) (s-1) (s^2 + 1)
  ---------------------------------------------------------
  (s+1) (s-1) (s^2 + 1.414s + 1) (s^2 - 1.414s + 1) (s^2 + 1)

Continuous-time zero/pole/gain model.
```

Problem 2

```
%a)
z2_a = poly([5  -4  1])
p2_a = poly([6 -13 -2])
g2_a = 8
G = tf(g2_a*z2_a,p2_a)

%b)
j=sqrt(-1);
z2_b = poly([2 1+j 1-j])
p2_b = poly([3 -1 -j j])
g2_b = 2
G = tf(g2_b*z2_b,p2_b)

%c)
z2_c = poly([-1 1 -j j])
p2_c = poly([0 3])
g2_c = -3
G = tf(g2_c*z2_c,p2_c)

z2_a =
     1    -2   -19    20
p2_a =
     1     9   -64  -156
g2_a =
     8

G =

  8 s^3 - 16 s^2 - 152 s + 160
  ----------------------------
    s^3 + 9 s^2 - 64 s - 156

Continuous-time transfer function.

z2_b =
     1    -4     6    -4
p2_b =
     1    -2    -2    -2    -3
g2_b =
     2

G =

    2 s^3 - 8 s^2 + 12 s - 8
  ---------------------------
  s^4 - 2 s^3 - 2 s^2 - 2 s - 3

Continuous-time transfer function.

z2_c =
     1     0     0     0    -1
```

```
p2_c =
     1    -3     0
g2_c =
    -3

G =

  -3 s^4 + 3
  ----------
  s^2 - 3 s

Continuous-time transfer function.
```

Problem 3

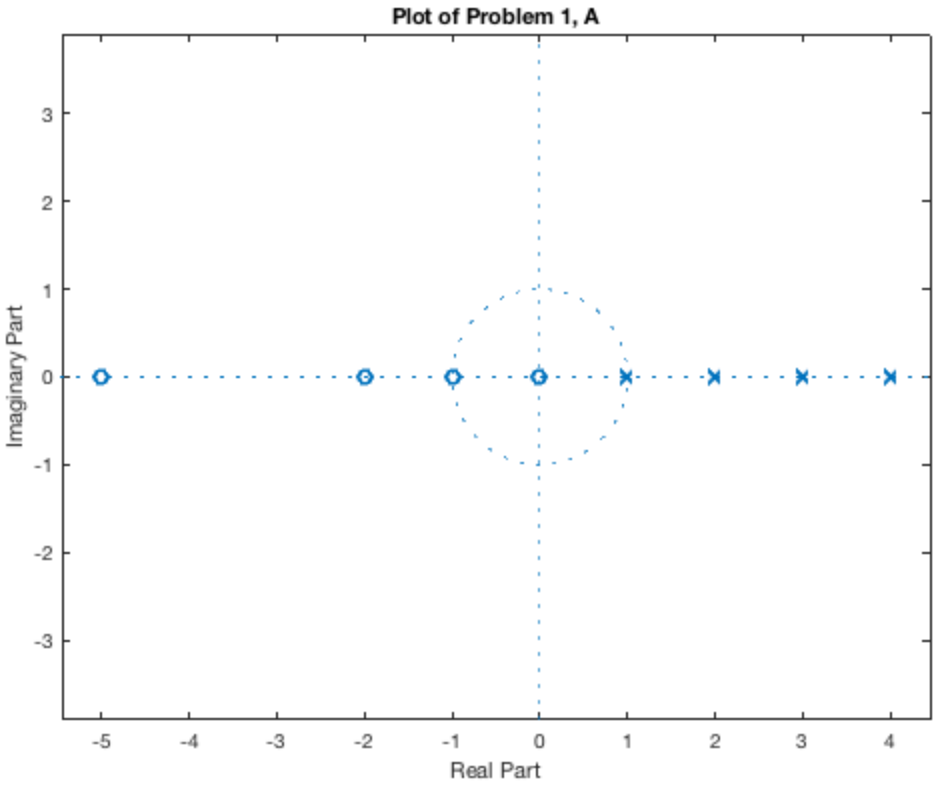
```
%a)
n_a = [4 0 -4]
d_a = [1 -3 0]
[r,p,k] = residue(n_a,d_a)

% = 10.667/(z-3) + 1.33/(z+4)

%b)
n_b = [1 0 0 1]
d_b = [1 0 1]
[r,p,k] = residue(n_b,d_b)
% = z+(-0.5-0.5j)/(z-j)+(-0.5+0.5j)/(z+j)

n_a =
     4     0    -4
d_a =
     1    -3     0
r =
   10.6667
    1.3333
p =
     3
     0
k =
     4
n_b =
     1     0     0     1
d_b =
     1     0     1
r =
  -0.5000 - 0.5000i
  -0.5000 + 0.5000i
p =
   0.0000 + 1.0000i
   0.0000 - 1.0000i
k =
     1     0
```

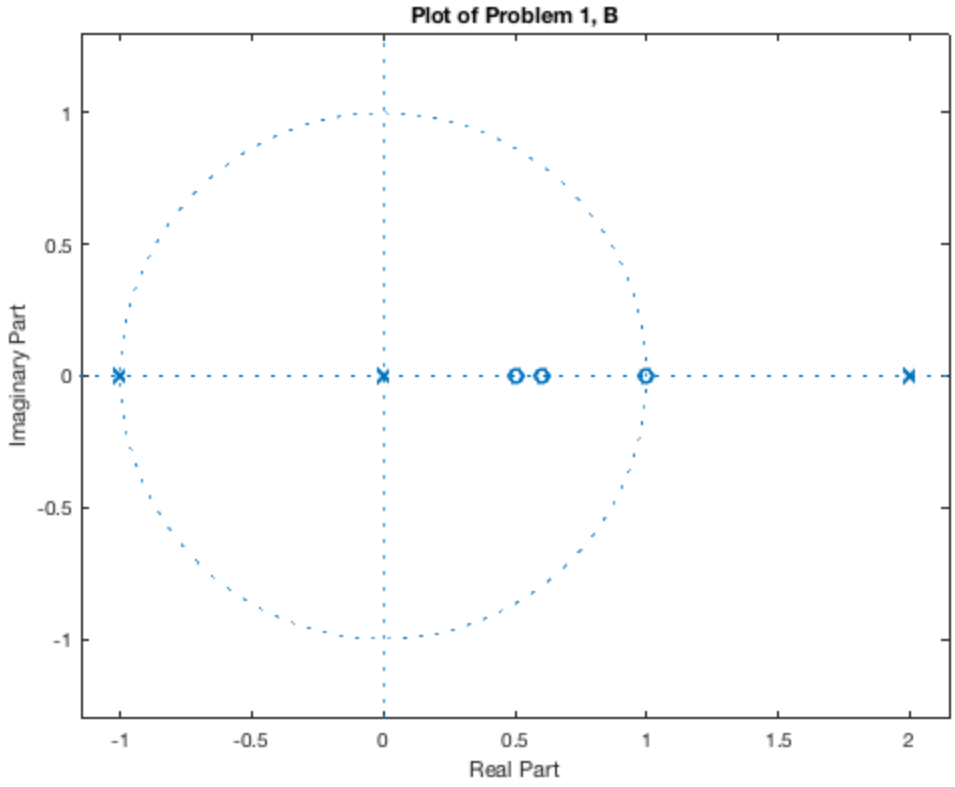
Problem 4

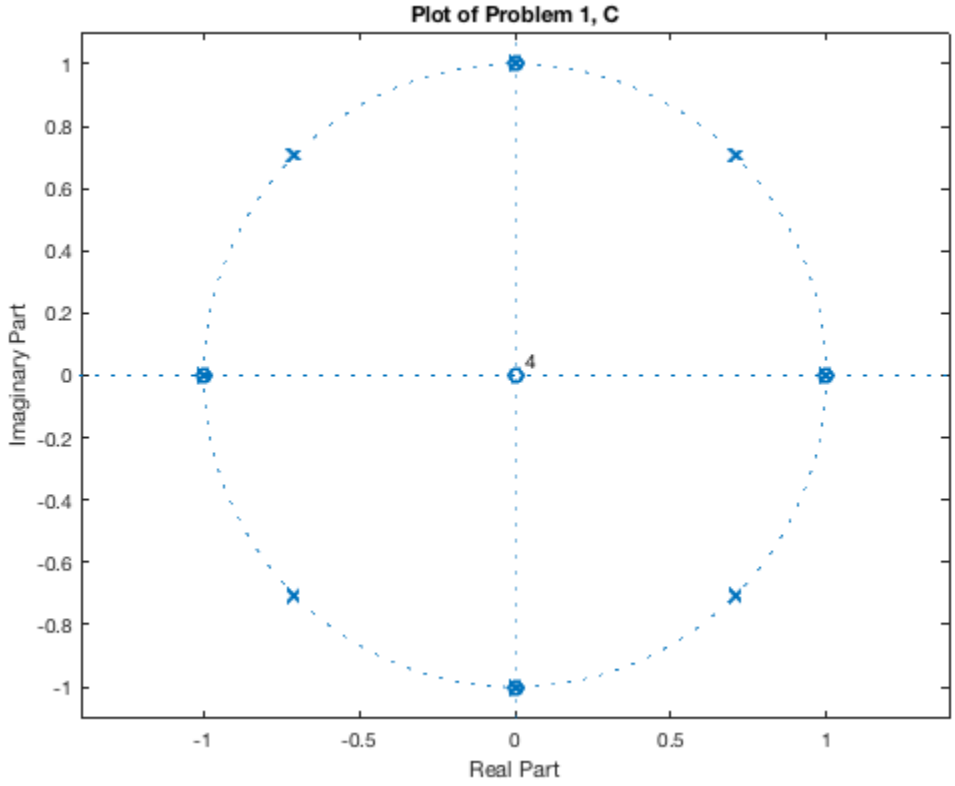
```
figure
zplaneplot(z1_a,p1_a)
title('Plot of Problem 1, A')

figure
zplaneplot(z1_b,p1_b)
title('Plot of Problem 1, B')

figure
zplaneplot(z1_c,p1_c)
title('Plot of Problem 1, C')
```

```
ans =
  Line with properties:

              Color: [0 0.4470 0.7410]
          LineStyle: 'none'
          LineWidth: 0.5000
             Marker: 'o'
         MarkerSize: 7
    MarkerFaceColor: 'none'
              XData: [0 -5.0000 -2.0000 -1.0000]
              YData: [1.0000e-50 1.0000e-50 1.0000e-50 1.0000e-50]
              ZData: [1×0 double]

  Use GET to show all properties
ans =
  Line with properties:

              Color: [0 0.4470 0.7410]
          LineStyle: 'none'
          LineWidth: 0.5000
             Marker: 'o'
         MarkerSize: 7
    MarkerFaceColor: 'none'
              XData: [1.0000 0.6000 0.5000]
              YData: [1.0000e-50 1.0000e-50 1.0000e-50]
              ZData: [1×0 double]

  Use GET to show all properties
ans =
  Line with properties:

              Color: [0 0.4470 0.7410]
          LineStyle: 'none'
          LineWidth: 0.5000
             Marker: 'o'
         MarkerSize: 7
    MarkerFaceColor: 'none'
              XData: [0 0 0 0 -1.0000 8.3267e-17 8.3267e-17 1.0000]
              YData: [0 0 0 0 0 1.0000 -1.0000 0]
```

```
    ZData: [1×0 double]

Use GET to show all properties
```




Plot of Problem 1, B
Imaginary Part
Real Part
1
0.5
0
-0.5
-1
-1
-0.5
0
0.5
1
1.5
2


Plot of Problem 1, C
Imaginary Part
Real Part
4
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1

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