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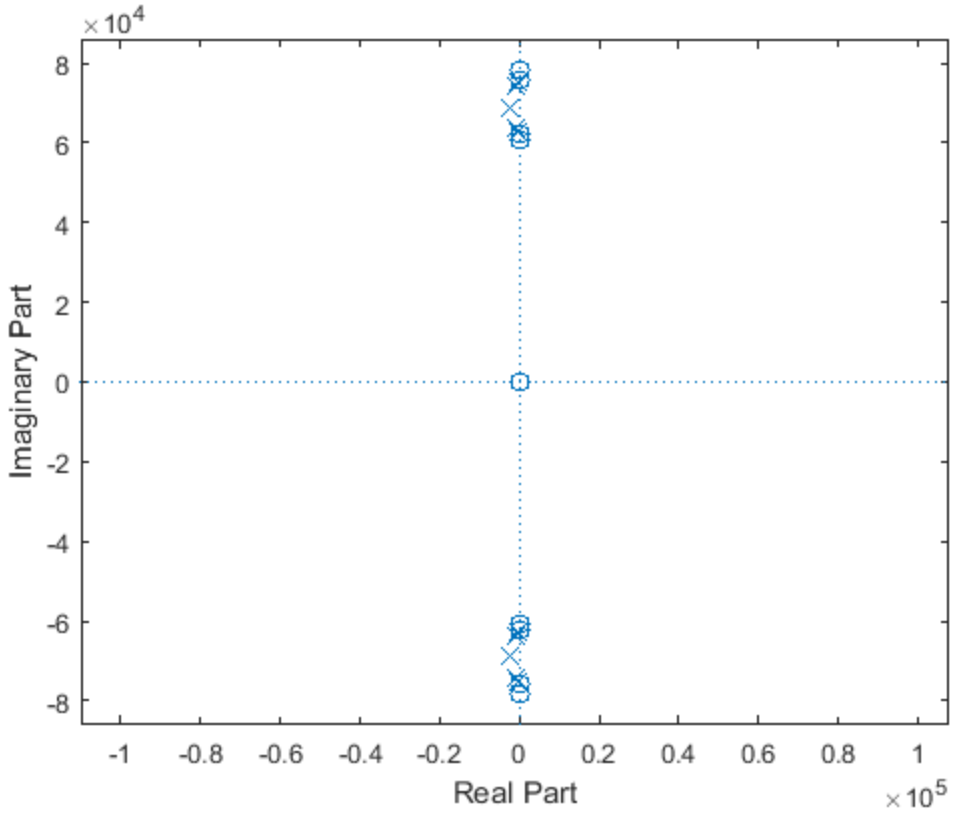
Benjamin Kaplan - Problem Set IV

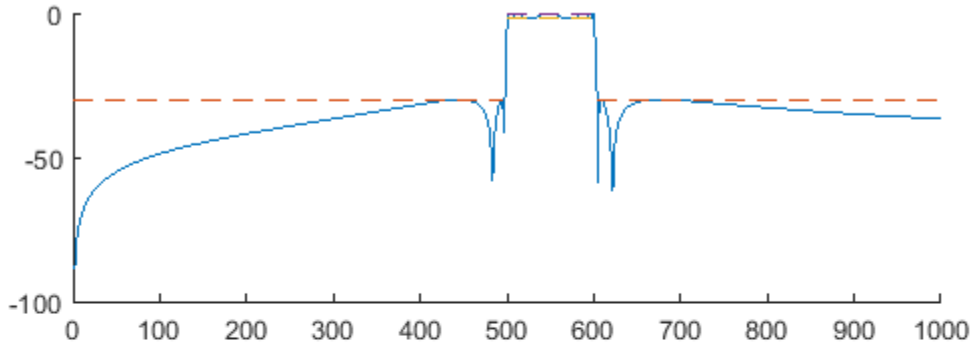
```
close all;
```

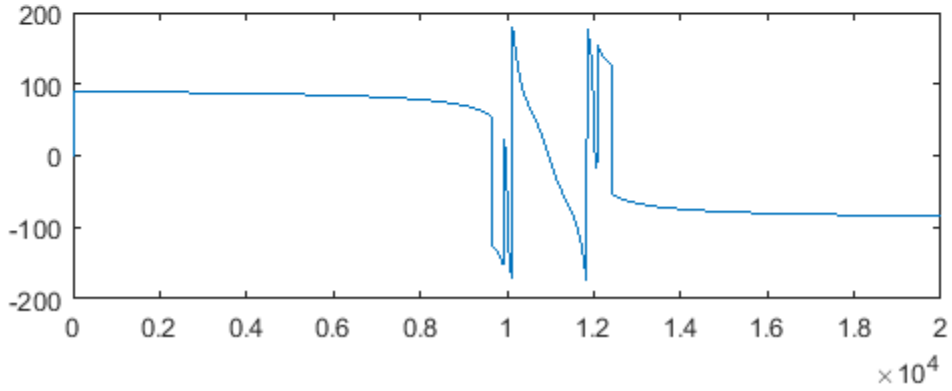
Analog Filter

```
fprintf('Order of analog filter is %d\n', filtord(b,a));
zplane(z,p);
figure;
subplot(2,1,1); hold on;
plot(mag2db(abs(H)));
stop = mag2db(abs(H))<-1*rs;
stop = stop * -1 *rs;
stop( stop == 0) = NaN;
plot(stop , '--');
pass = mag2db(abs(H)) > -1*rp;
pass = pass *-1*rp;
pass(pass == 0) = NaN;
plot(pass, '--');
zerodb = zeros([1 1000]);
TF = isnan(pass);
zerodb(TF) = NaN;
plot(zerodb, '--');
hold off;
subplot(2,1,2);
plot(linspace(1,fNyq,1000),rad2deg(angle(H)));
```

```
Order of analog filter is 10
```


×10^4
8
6
4
2
0
-2
-4
-6
-8
Imaginary Part
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Real Part
×10^5

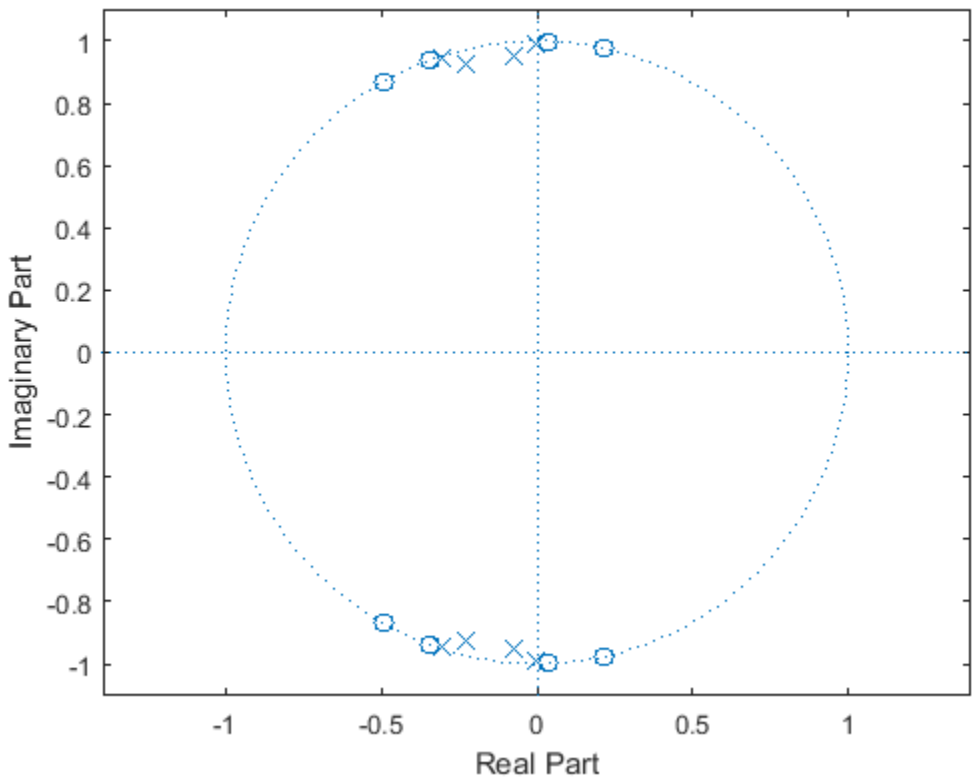

0
-50
-100
0
100
200
300
400
500
600
700
800
900
1000

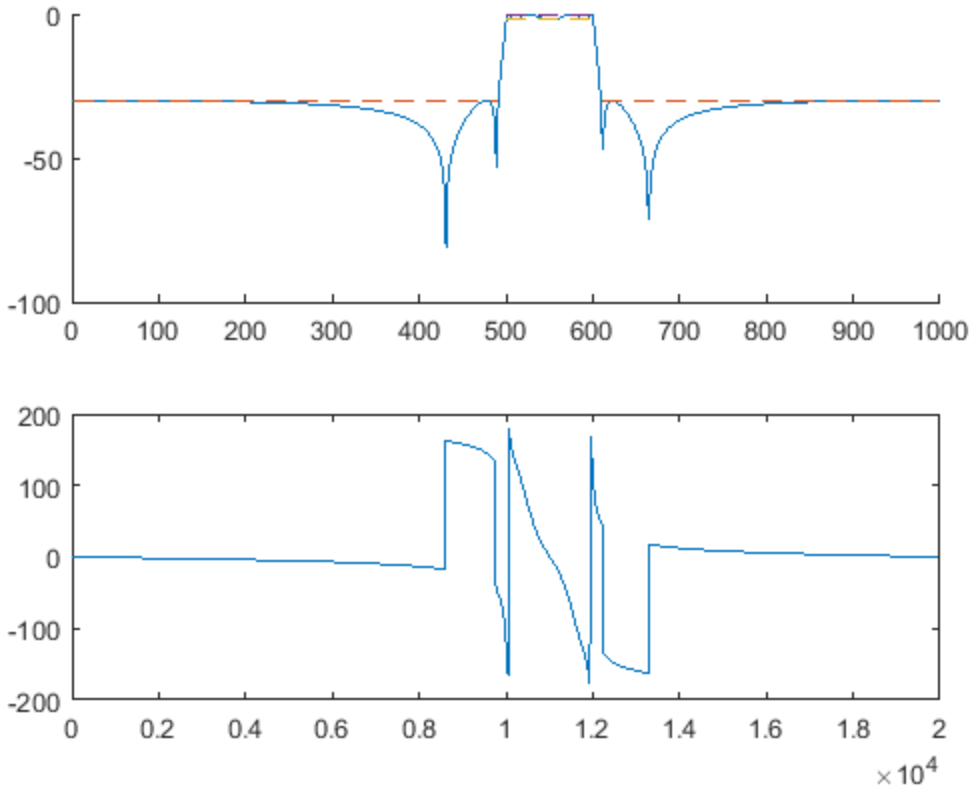

200
100
0
-100
-200
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
×10^4

Digital Filter

```
fprintf('Order of digital filter is %d\n', filtord(bd, ad));
figure;
zplane(zd,pd);
figure;
subplot(2,1,1);
hold on;
plot(mag2db(abs(Hd)));
stop = mag2db(abs(Hd))<-1*rs;
stop = stop * -1 *rs;
stop( stop == 0) = NaN;
plot(stop , '--');
pass = mag2db(abs(Hd)) > -1*rp;
pass = pass *-1*rp;
pass(pass == 0) = NaN;
plot(pass, '--');
zerodb = zeros([1 1000]);
TF = isnan(pass);
zerodb(TF) = NaN;
plot(zerodb, '--');
hold off;
subplot(2,1,2);
plot(linspace(1,fNyq,1000),rad2deg(angle(Hd)));
```

Order of digital filter is 8





Question 6

```
z6 = [0.8*exp(j*pi/6) ; 0.8*exp(-j*pi/6) ];
p6 = [ 0.9*exp(j * 3 * pi / 4) ; 0.9*exp(-j * 3 * pi / 4) ];
k6 = 1;
[b6 , a6] = zp2tf(z6,p6,k6);
[h6,t6] = impz(b6,a6);
figure;
stem(t6,h6);
fNyq6 = (150e6)/2;
[freqresp,angresp] = freqz(b,a,linspace(0,fNyq6,1000));
figure;
subplot(2,1,1);
plot(mag2db(abs(freqresp)));
subplot(2,1,2);
plot(rad2deg(angle(freqresp)));

X = Xt(0:50)
Y = filter(b6,a6,X);
figure;
subplot(2,1,1);

stem(X); title('X[n] Discrete');
subplot(2,1,2);
stem(Y); title('Y[n] Discrete');
```

```
figure;
subplot(2,1,1);

plot(X);
title('X(t) continuous');
subplot(2,1,2);
plot(Y);
title('Y(t) Continuous');

cols = 51

input =

  Columns 1 through 13

    0     1     2     3     4     5     6     7     8     9    10
11    12

  Columns 14 through 26

   13    14    15    16    17    18    19    20    21    22    23
24    25

  Columns 27 through 39

   26    27    28    29    30    31    32    33    34    35    36
37    38

  Columns 40 through 51

   39    40    41    42    43    44    45    46    47    48    49
50


X =

  Columns 1 through 13

    1     0     0     0     0     0     0     0     0     0     0
0     0

  Columns 14 through 26

    0     0     0     0     0     0     0     0     0     0     0
0     0

  Columns 27 through 39

    0     0     0     0     0     0     0     0     0     0     0
0     0

  Columns 40 through 51
```

```
     0     0     0     0     0     0     0     0     0     0     0
     0
```

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