DIGITAL SIGNAL PROCESSING LAB

(EL-302)

LABORATORY MANUAL

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Discrete Time Systems in the Transform (Z)-Domain

(LAB # 09)

Student Name: _____

Roll No: _____ Section: ___

Date performed: _____, 2019

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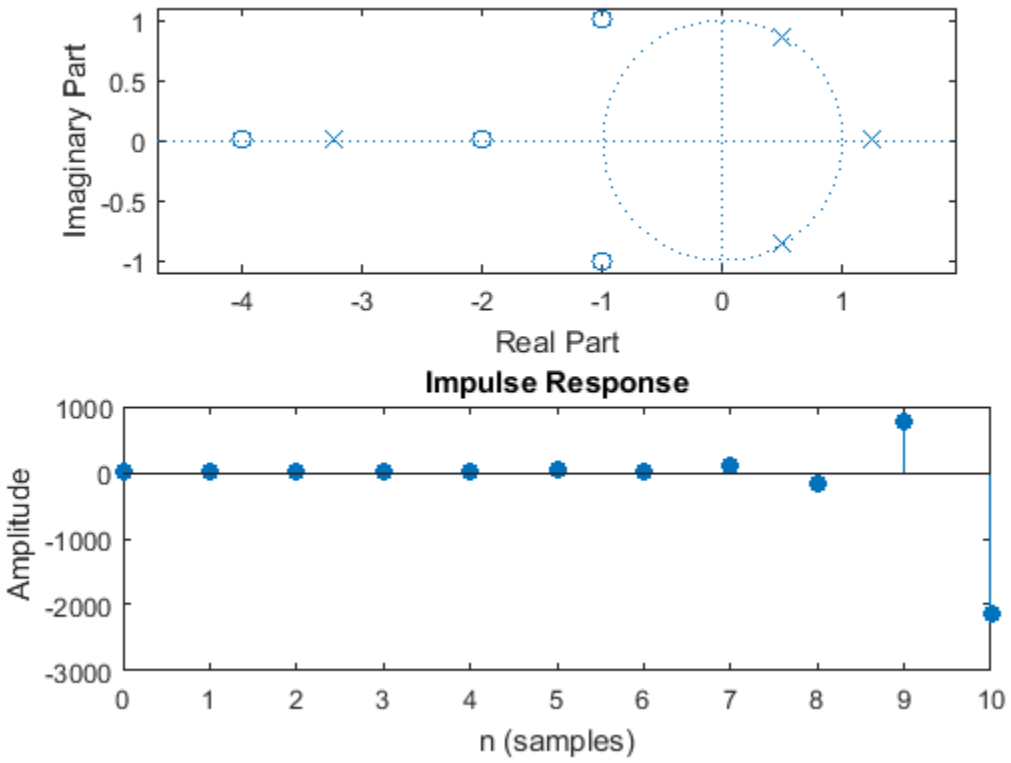
Updated: Spring 2016

T1:

```
num=[2 16 44 56 32];
den=[3 3 -15 18 -12];
subplot 211
[z p k]=tf2zpk(num,den)
zplane(z,p)
subplot 212
impz(num,den)
```

```
z =

  -4.0000 + 0.0000i
  -2.0000 + 0.0000i
  -1.0000 + 1.0000i
  -1.0000 - 1.0000i


p =

  -3.2361 + 0.0000i
   1.2361 + 0.0000i
   0.5000 + 0.8660i
   0.5000 - 0.8660i


k =

    0.6667
```



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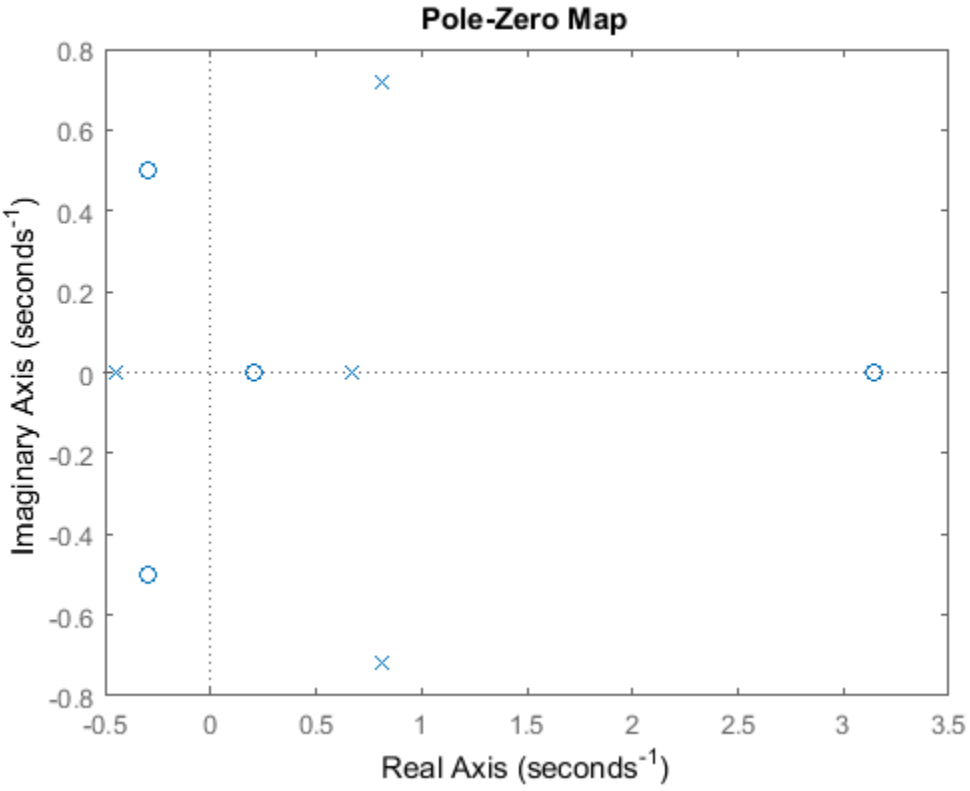
T2:

```
z=[0.21;  3.14;-0.3+j*0.5;-0.3-j*0.5];
 p=[-0.45; 0.67; 0.81+j*0.72; 0.81-j*0.72] ;
 k=2.2;
 [num,den]=zp2tf(z,p,k);
 pzmap(num,den)
```



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T3:

```
num=[18 0 0 0];
den=[18 3 -4 -1];
[r,p,k]=residuez(num,den)
a='(0.36/1-0.5z^-1) + (0.24/1+0.3333z^-1)+(0.4/1+0.3333z^-1)'
```

```
r =

    0.3600
    0.2400
    0.4000


p =

    0.5000
   -0.3333
   -0.3333
```

```
k =

     0


a =

(0.36/1-0.5z^-1) + (0.24/1+0.3333z^-1)+(0.4/1+0.3333z^-1)
```

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T4:

```
syms z
a1=(0.36/1-(0.5)*z^-1);
a2=(0.24/1+(0.3333)*z^-1);
a3=(0.4/1+(0.3333)*z^-1);
a=[a1;a2;a3]
iztrans(a)
```

```
a =

        9/25 - 1/(2*z)
 3333/(10000*z) + 6/25
  3333/(10000*z) + 2/5


ans =

            (9*kroneckerDelta(n, 0))/25 - kroneckerDelta(n - 1, 0)/2
 (3333*kroneckerDelta(n - 1, 0))/10000 + (6*kroneckerDelta(n, 0))/25
  (3333*kroneckerDelta(n - 1, 0))/10000 + (2*kroneckerDelta(n, 0))/5
```

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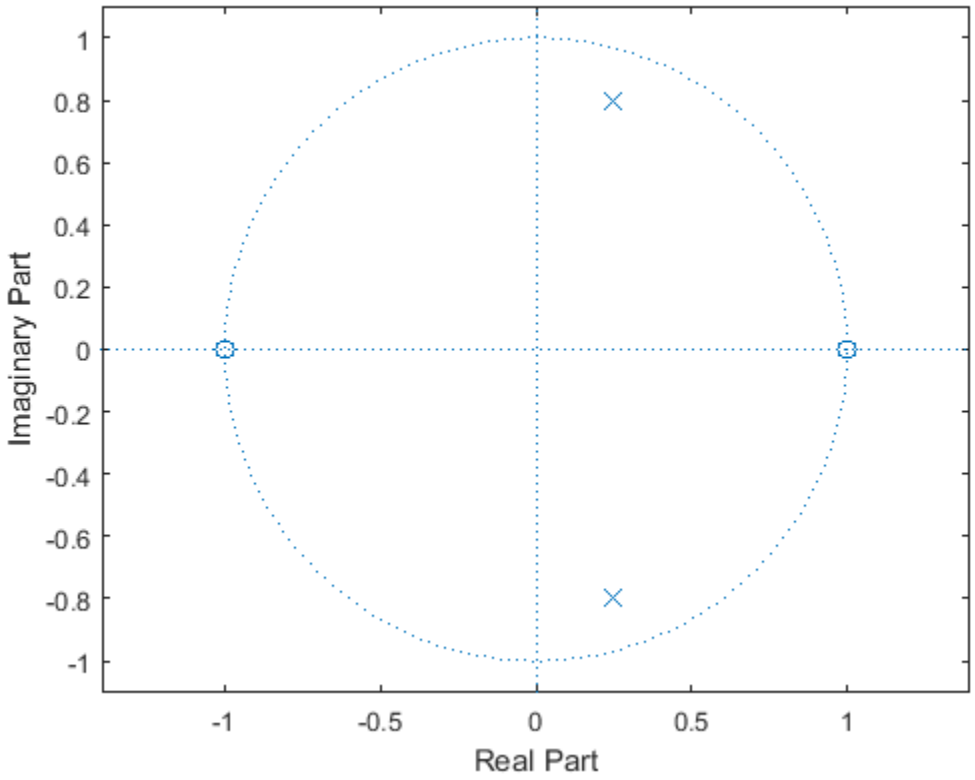
T5:

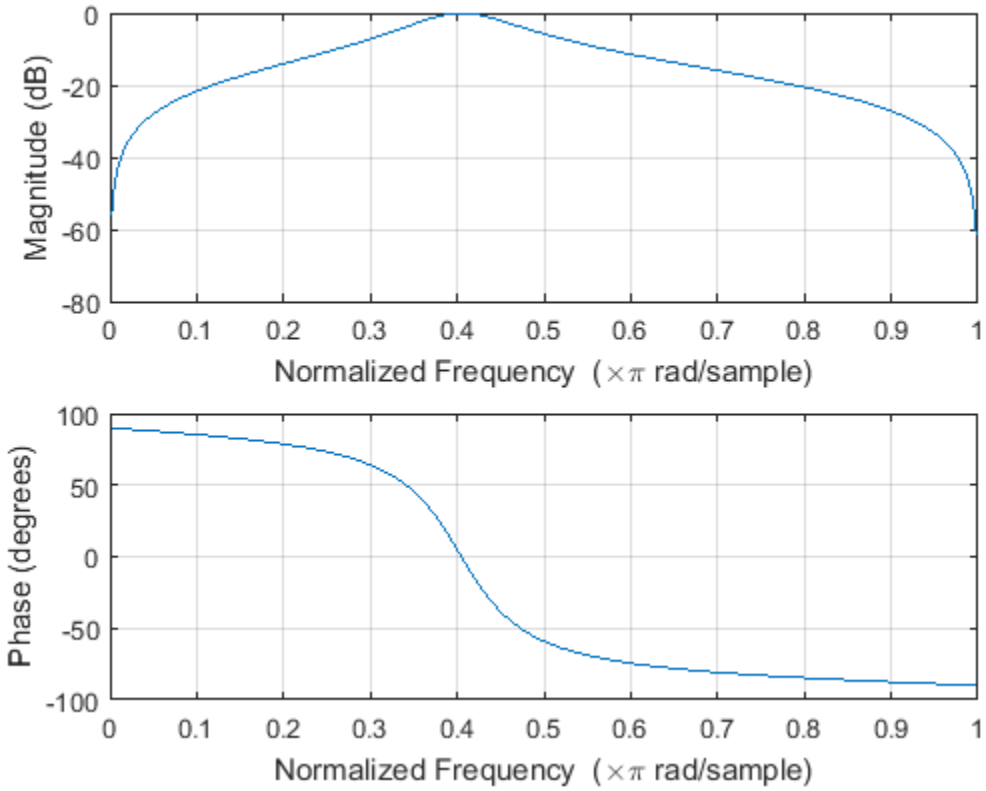
```
num=[0.15 0 -.15];
den=[1 -0.5 0.7];
mytf=tf(num,den)
[z p k]=tf2zpk(num,den);
zplane(z,p)
figure
freqz(num,den)
```

```
mytf =

   0.15 s^2 - 0.15
  -----------------
  s^2 - 0.5 s + 0.7

Continuous-time transfer function.
```





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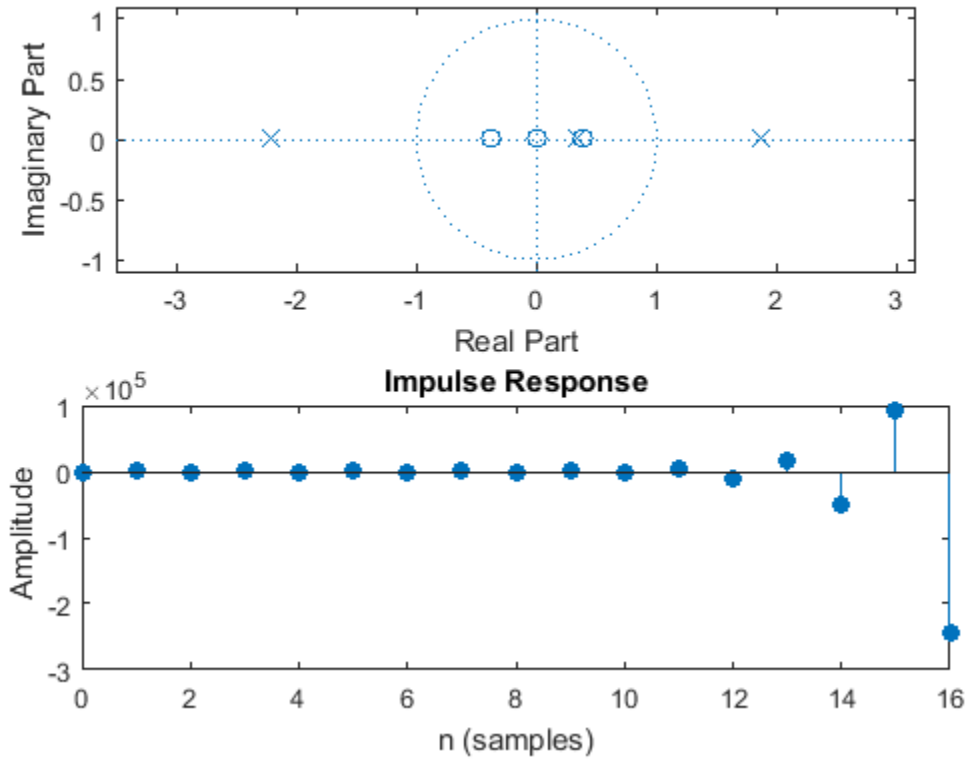
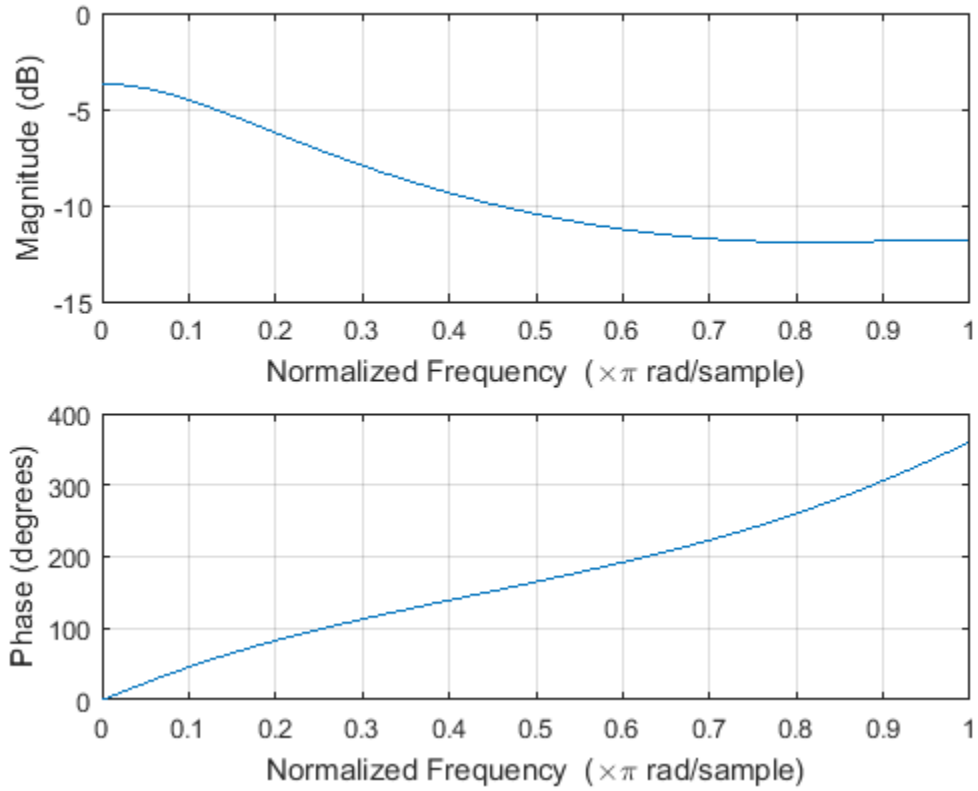
T6:

```
close all
clear all
num=[-1 0 0.15];
den=[0.7 0 -3 1];

mytff=tf(num,den)
subplot 211
zplane(num,den)
subplot 212
impz(num,den)
figure
freqz(num,den)
```

```
mytff =

     -s^2 + 0.15
  ----------------
  0.7 s^3 - 3 s + 1
```

```
Continuous-time transfer function.
```





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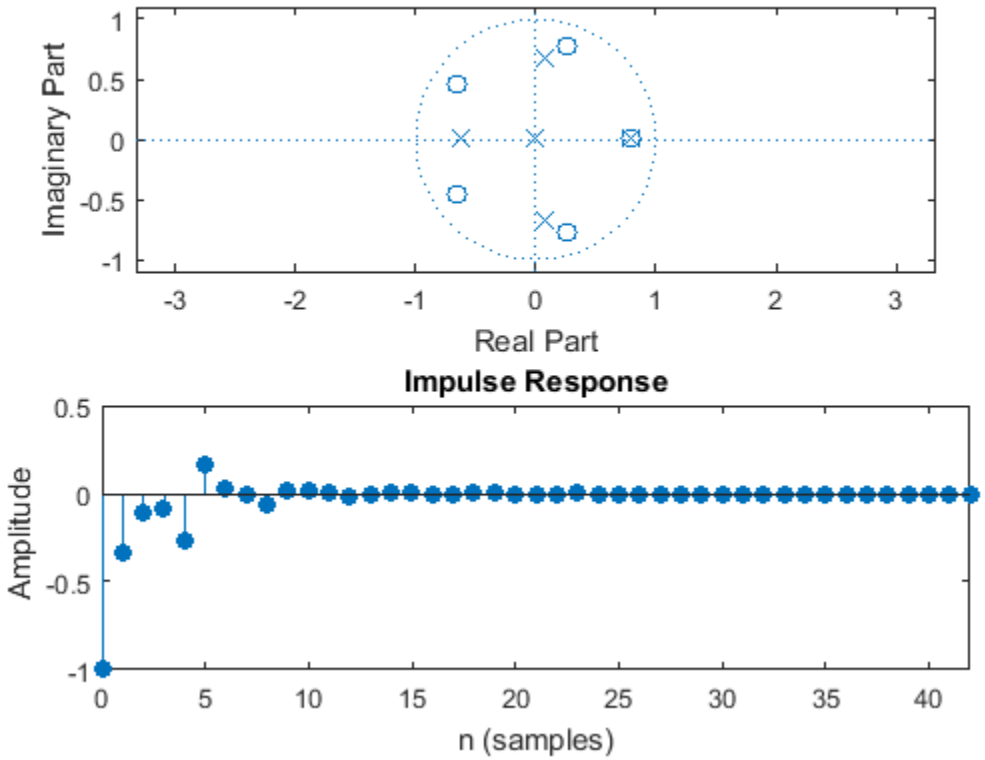
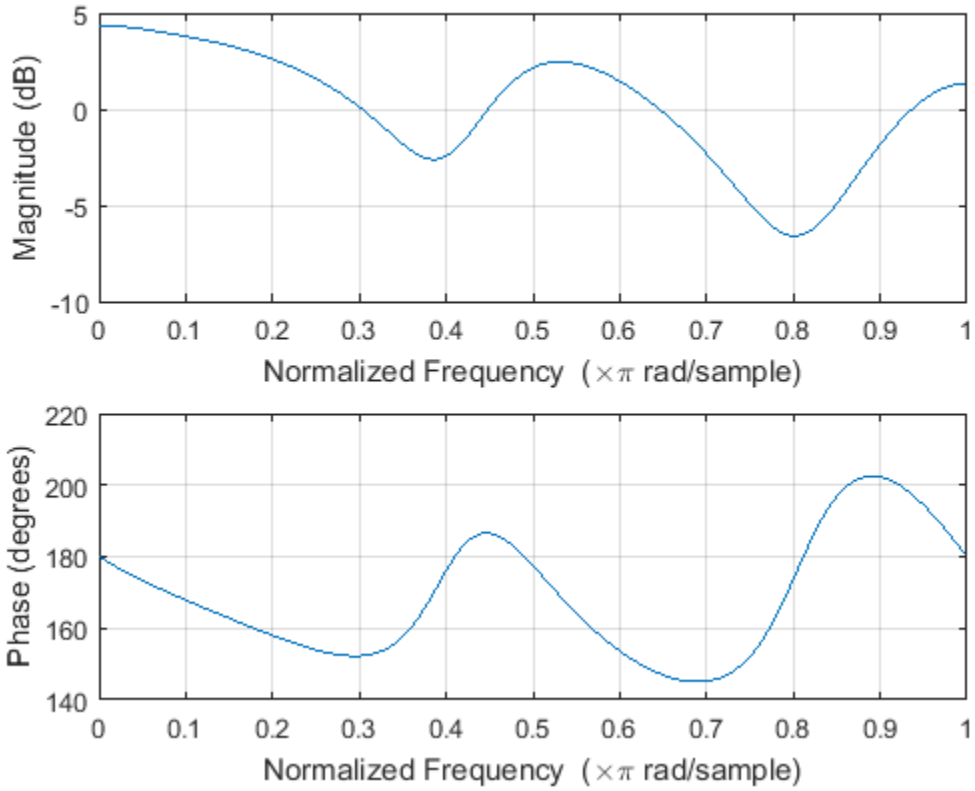
T7:

```
close all
clear all
num=[3 0 0 0.15 0 -1];
den=[-3 1  0 0  .7];

mrtf=tf(num,den)
subplot 211
zplane(num,den)
subplot 212
impz(num,den)
figure
freqz(num,den)
```

```
mrtf =

  -3 s^5 - 0.15 s^2 + 1
  ---------------------
    3 s^4 - s^3 - 0.7
```

```
Continuous-time transfer function.
```





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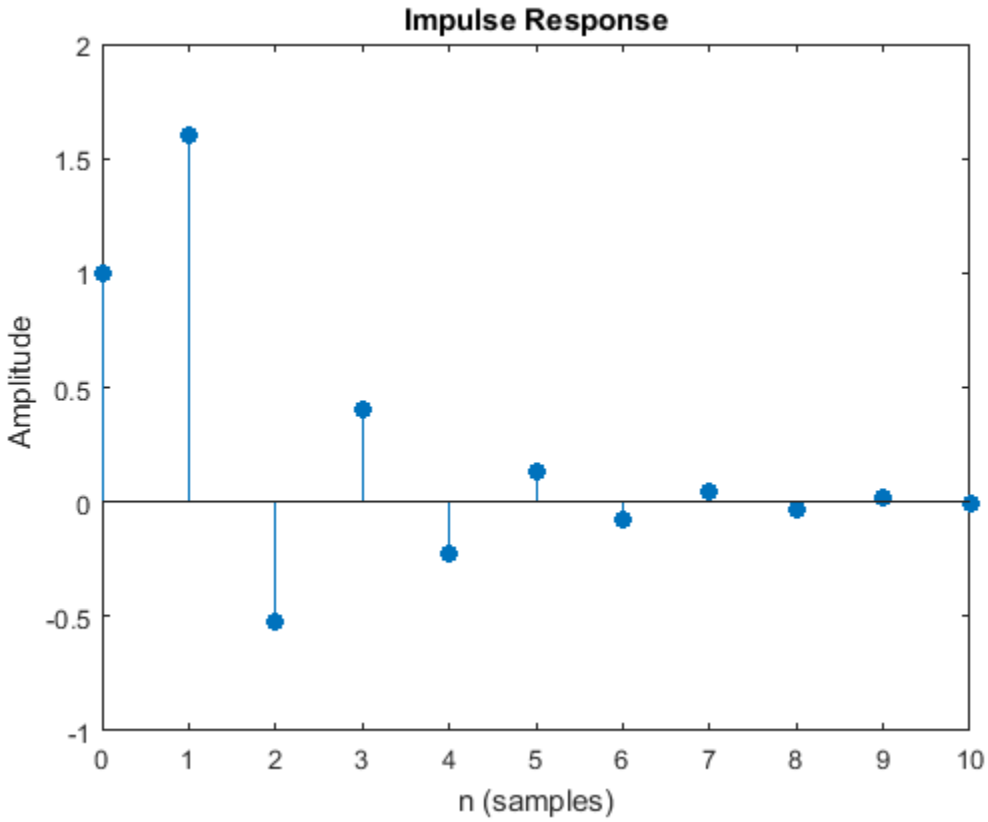
T8:

```
close all
clear all
num=[1 2];
den=[1 0.4 -0.12];
impz(num,den,11)
```



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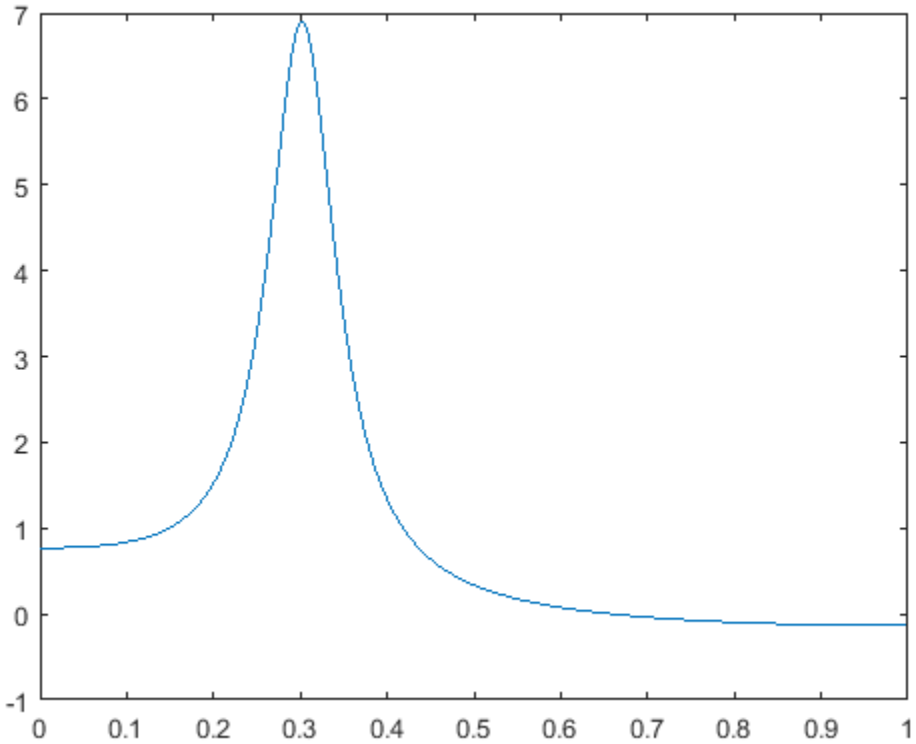
T9:

```
close all
clear all
num=[1 -1.2 1];
den=[1 -1.3 1.04 -0.22];
[gd,w]=grpdelay(num,den);
plot(w/pi,gd)
```



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