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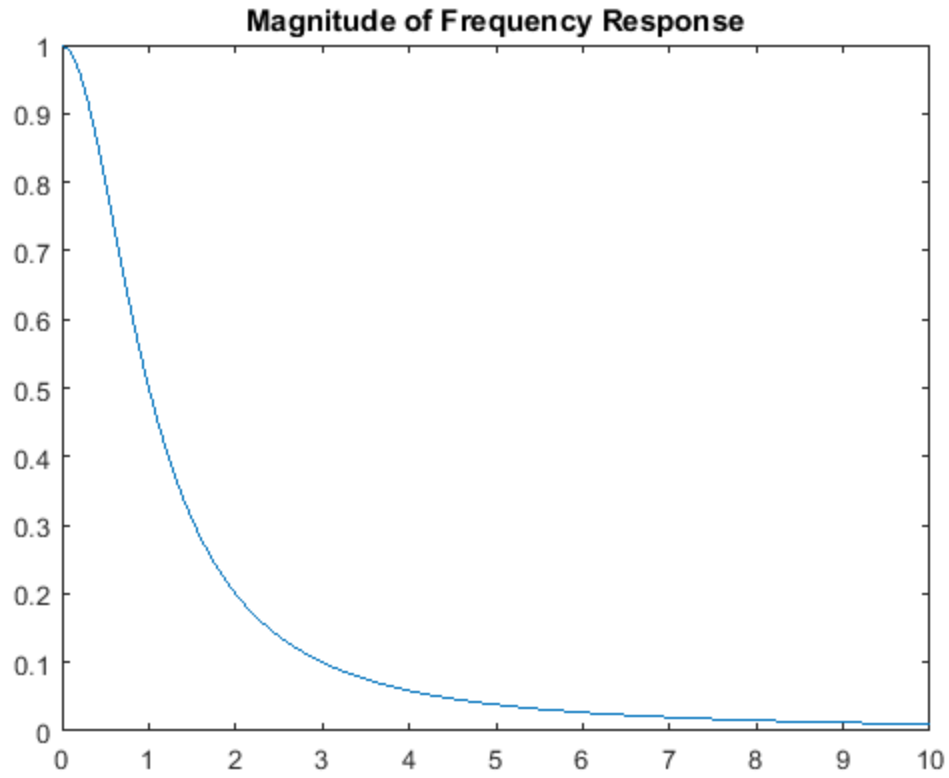
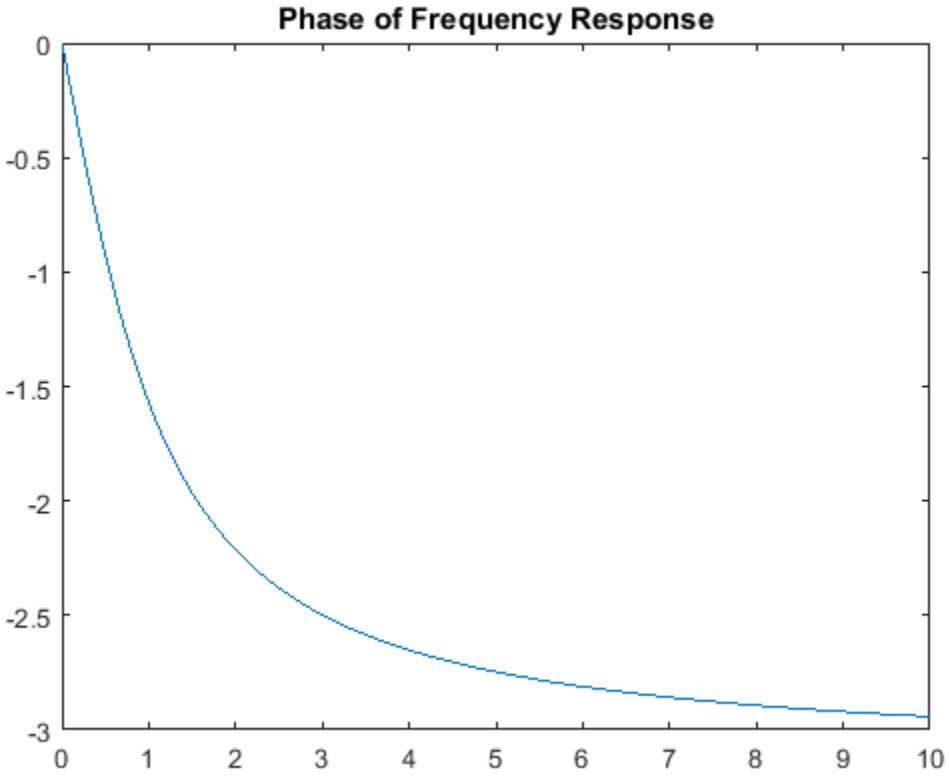
LSS Lab 10 - Section C2 7/7/2017

```
close all; clc; clear;
```

Problem 1

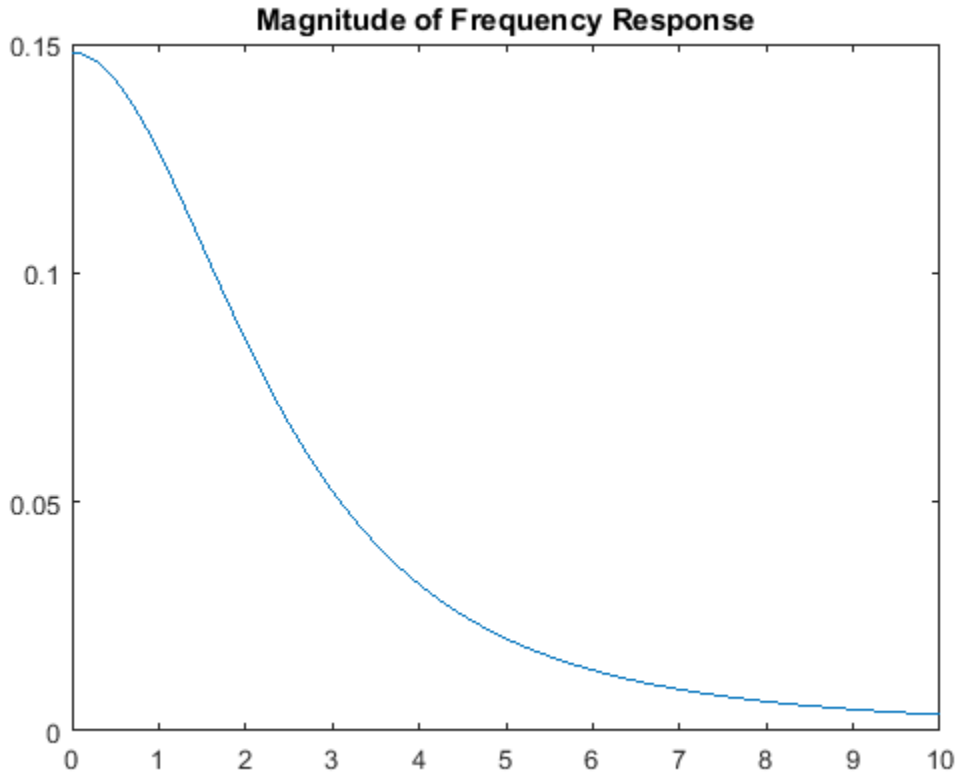
```
syms t w
h = t.*exp(-t).*heaviside(t);
fh = fourier(h,w);
w0 = 0:.1:10;
fp = subs(fh,w,w0);

figure;
plot(w0, abs(fp))
title('Magnitude of Frequency Response');
figure;
plot(w0, angle(fp))
title('Phase of Frequency Response');
```

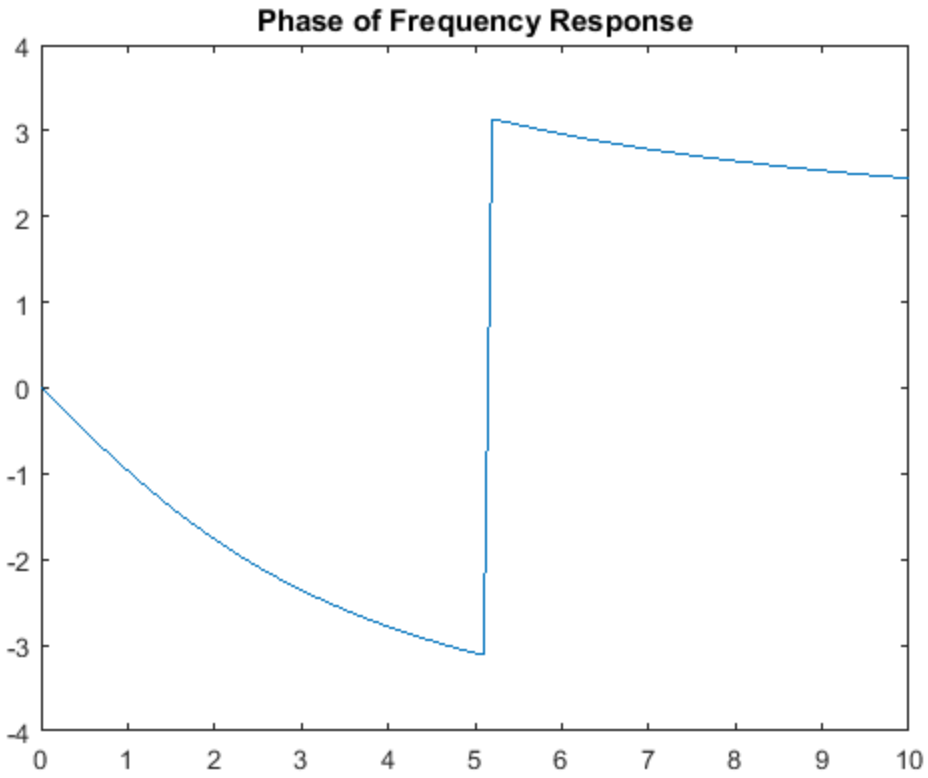

Magnitude of Frequency Response
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
8
9
10

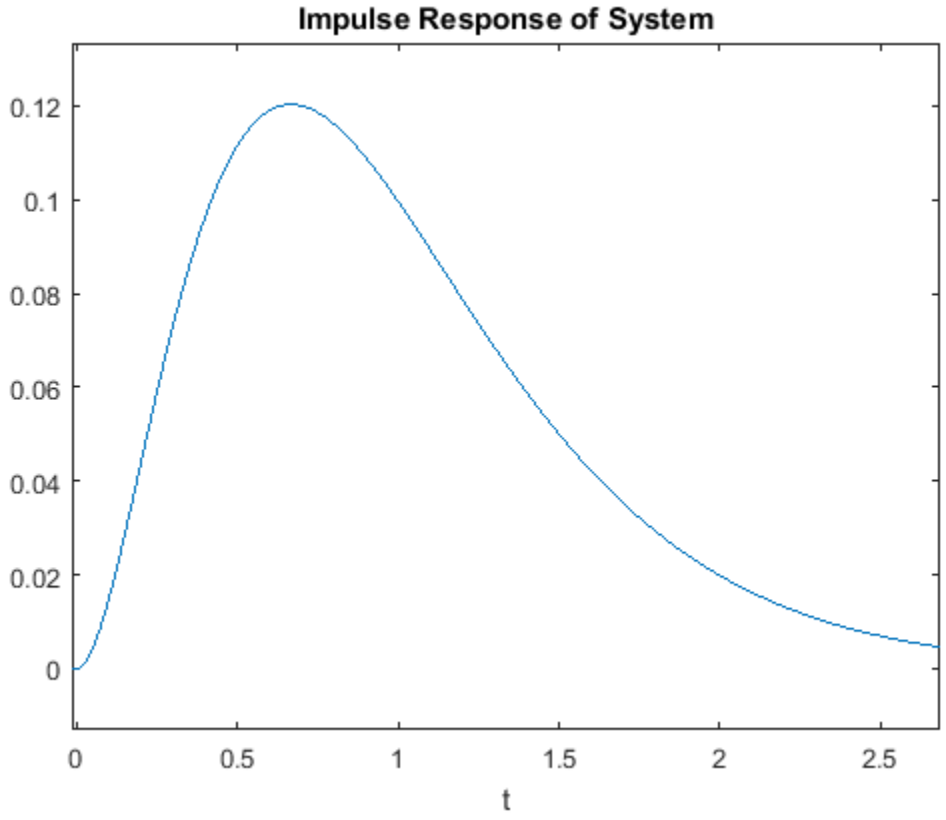

Phase of Frequency Response
0
-0.5
-1
-1.5
-2
-2.5
-3
0
1
2
3
4
5
6
7
8
9
10

Problem 2

```
syms w
num = 4;
den = [1 9 27 27];
% (3+j*w)^3 = (jw)^3 + 9(jw)^2 + 27(jw) + 27
w1 = 0:.1:10;
H = freqs(num,den,w1);

figure;
plot(w1, abs(H))
title('Magnitude of Frequency Response');
figure;
plot(w1, angle(H))
title('Phase of Frequency Response');

h = 4/(3+j*w).^3;
hi = ifourier(h);
figure;
ezplot(hi)
title('Impulse Response of System');
xlabel('t');
```

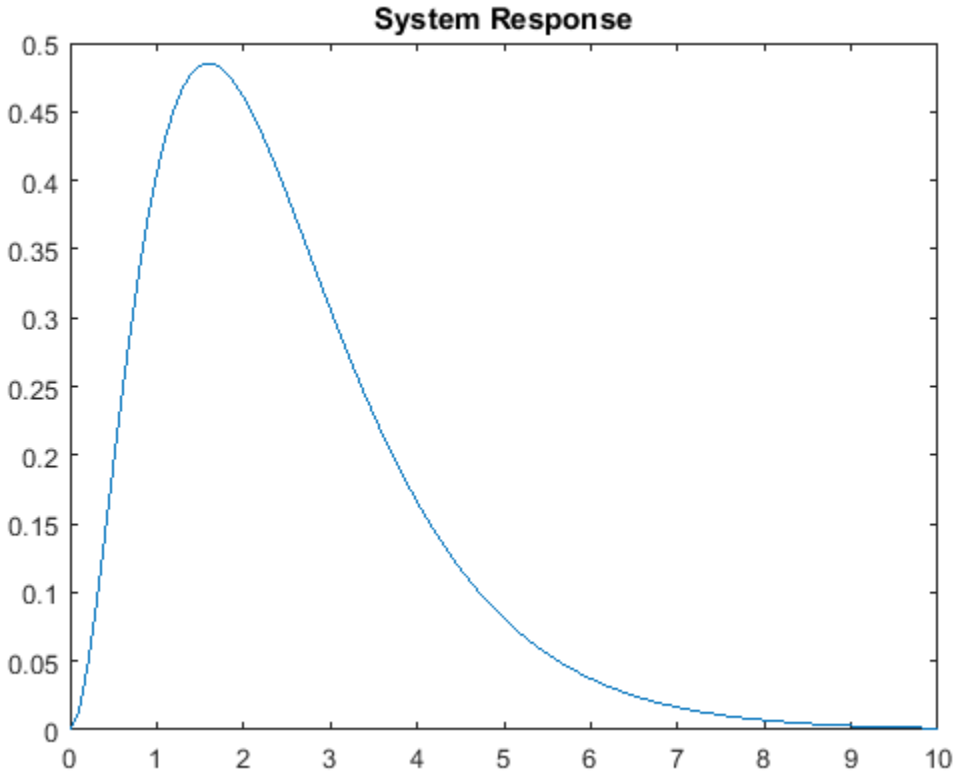


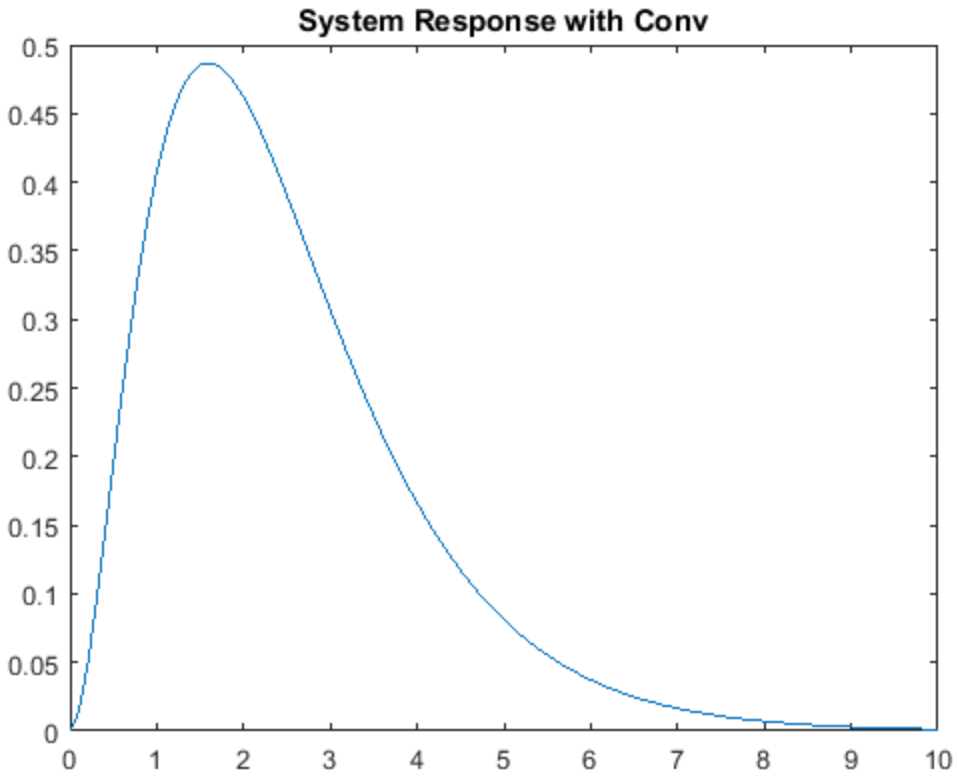

Phase of Frequency Response
4
3
2
1
0
-1
-2
-3
-4
0
1
2
3
4
5
6
7
8
9
10


Impulse Response of System
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.5
1
1.5
2
2.5
t

Problem 3

```
syms w
num = 3;
den = [1 2];
t = 0:.1:10;
x = t.*exp(-t).*heaviside(t);
y = lsim(num, den, x, t);
plot(t,y)
title('System Response')

% Conv Method
h = 3/(j*w+2);
hi = eval(ifourier(h,t));
y1 = conv(x,hi)*.1;
figure;
plot(0:.1:20, y1);
title('System Response with Conv'); xlim([0 10]);
```

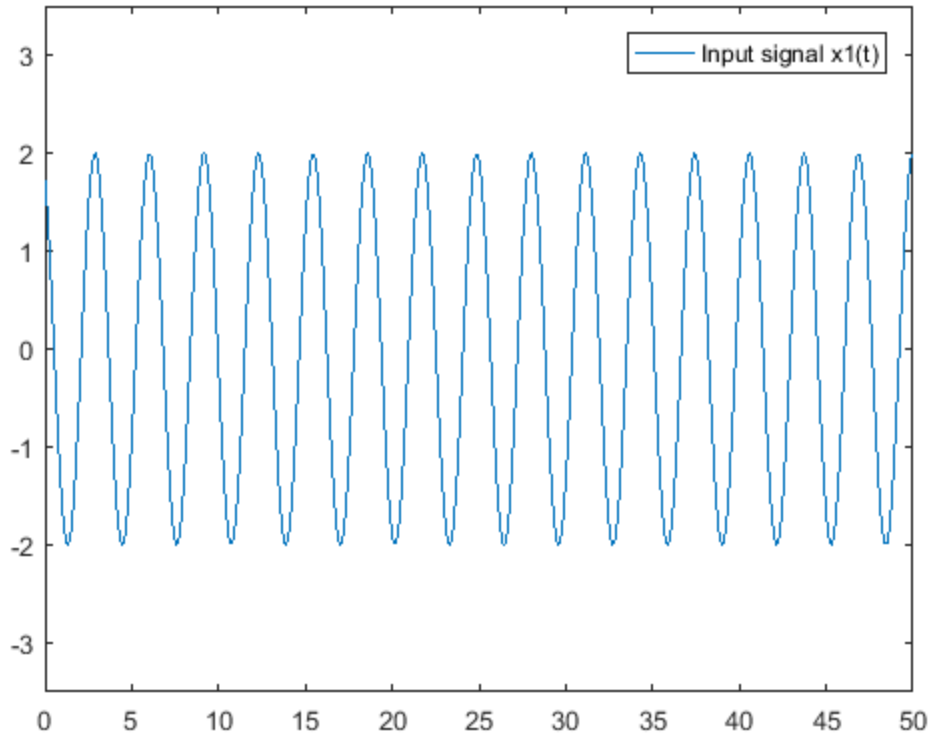


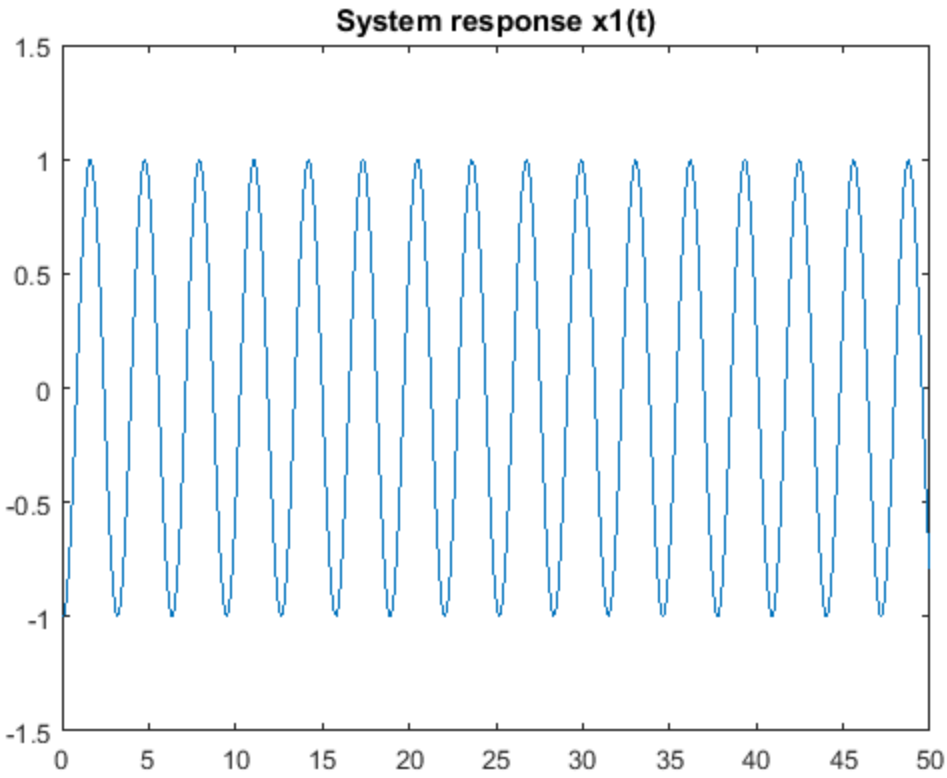


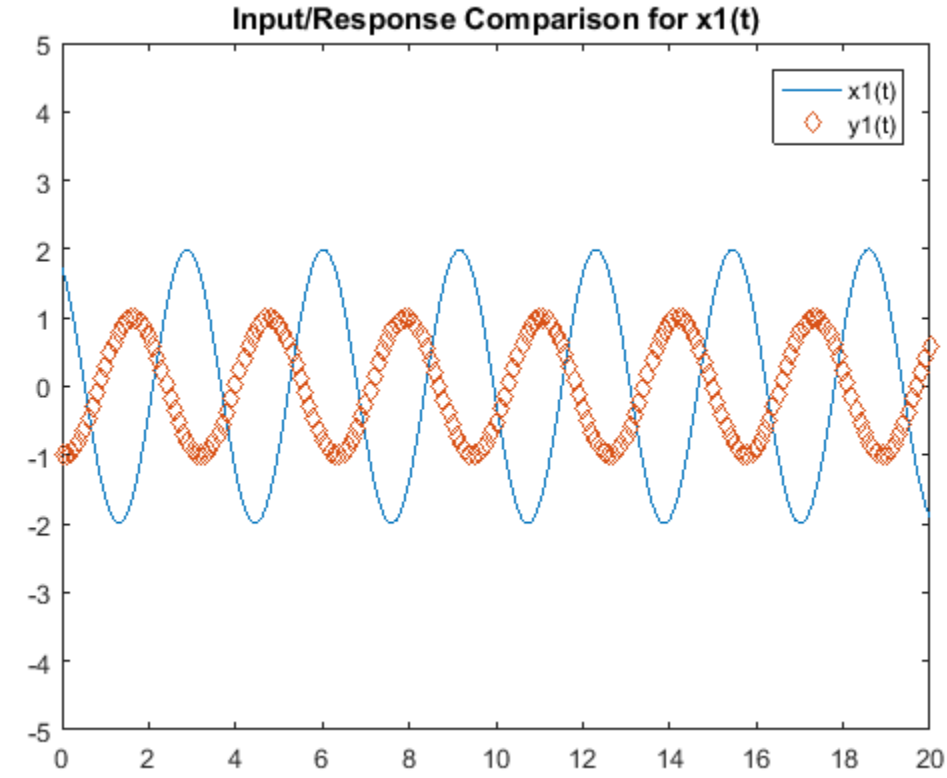
Problem 4

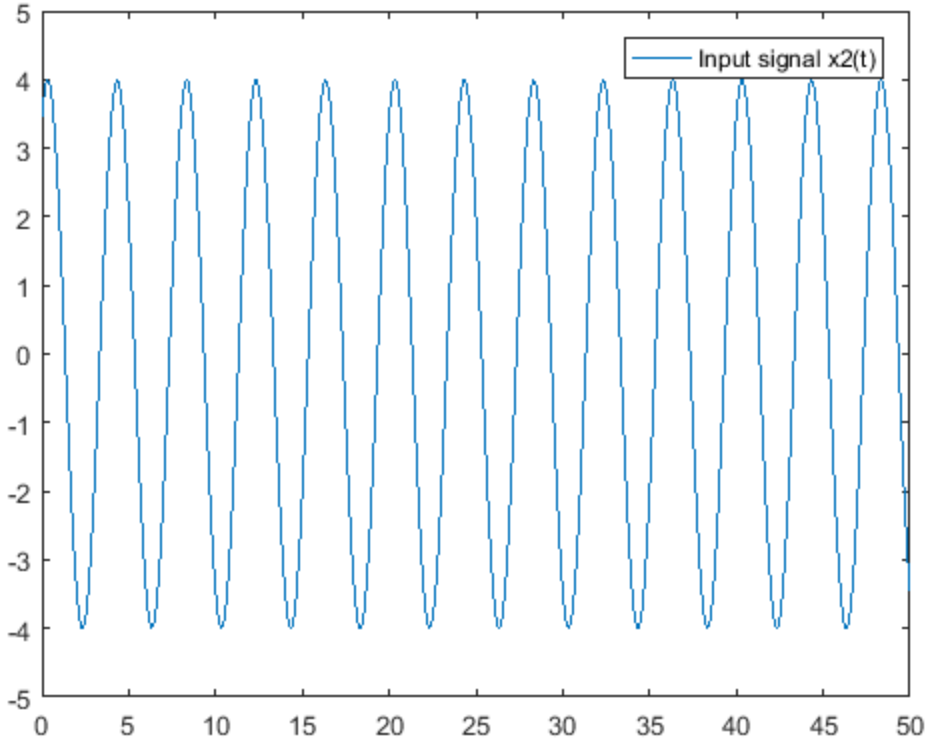
```
t = 0:.1:50;
w0 = 1;
H =(2*(j*w0)^2-j*w0)/(-w0^2+4*j*w0+3);

% 4a.
x1 = 2*cos(2*t+pi/6);
figure; plot(t,x1);
legend('Input signal x1(t)')
ylim([-3.5 3.5]);

y1=2*abs(H)*cos(2*t+pi/6+angle(H));
figure;
plot(t,y1);
title('System response x1(t)')
ylim([-1.5 1.5]);

figure;
plot(t,x1,t,y1,'d')
ylim([-5 5]); xlim([0 20])
title('Input/Response Comparison for x1(t)'); legend('x1(t)','y1(t)')

% 4b.
x2 = 4*sin((pi/2)*t+pi/3);
```

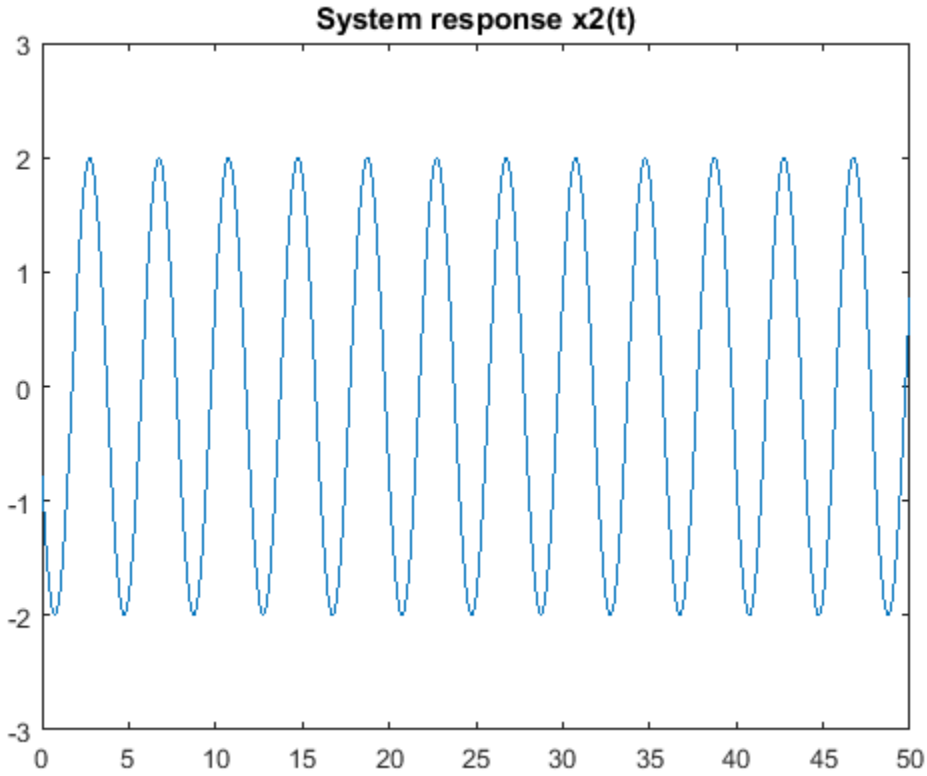
```
figure; plot(t,x2);
legend('Input signal x2(t)')
ylim([-5 5]);

y2 = 4*abs(H)*sin((pi/2)*t+pi/3+angle(H));
figure;
plot(t, y2)
title('System response x2(t)')
ylim([-3 3]);

figure;
plot(t,x2,t,y2,'d')
ylim([-5 5]); xlim([0 20])
title('Input/Response Comparison for x2(t)'); legend('x2(t)','y2(t)')
```

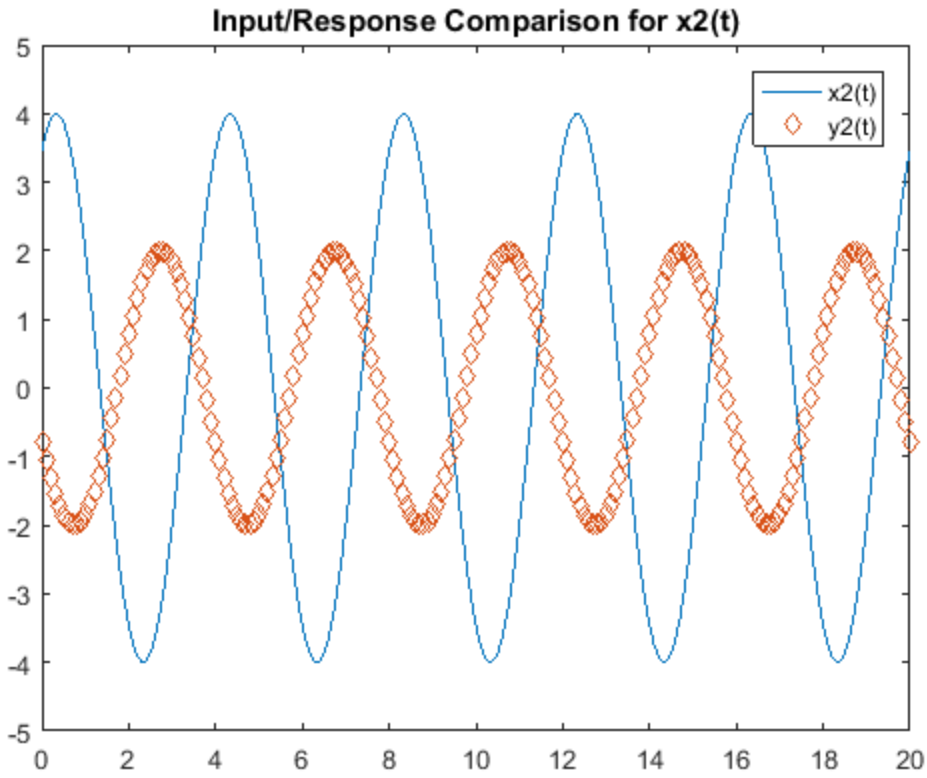



System response x1(t)
1.5
1
0.5
0
-0.5
-1
-1.5
0
5
10
15
20
25
30
35
40
45
50


Input/Response Comparison for x1(t)
x1(t)
y1(t)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
20


Input signal x2(t)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5
10
15
20
25
30
35
40
45
50


System response x2(t)
3
2
1
0
-1
-2
-3
0
5
10
15
20
25
30
35
40
45
50



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