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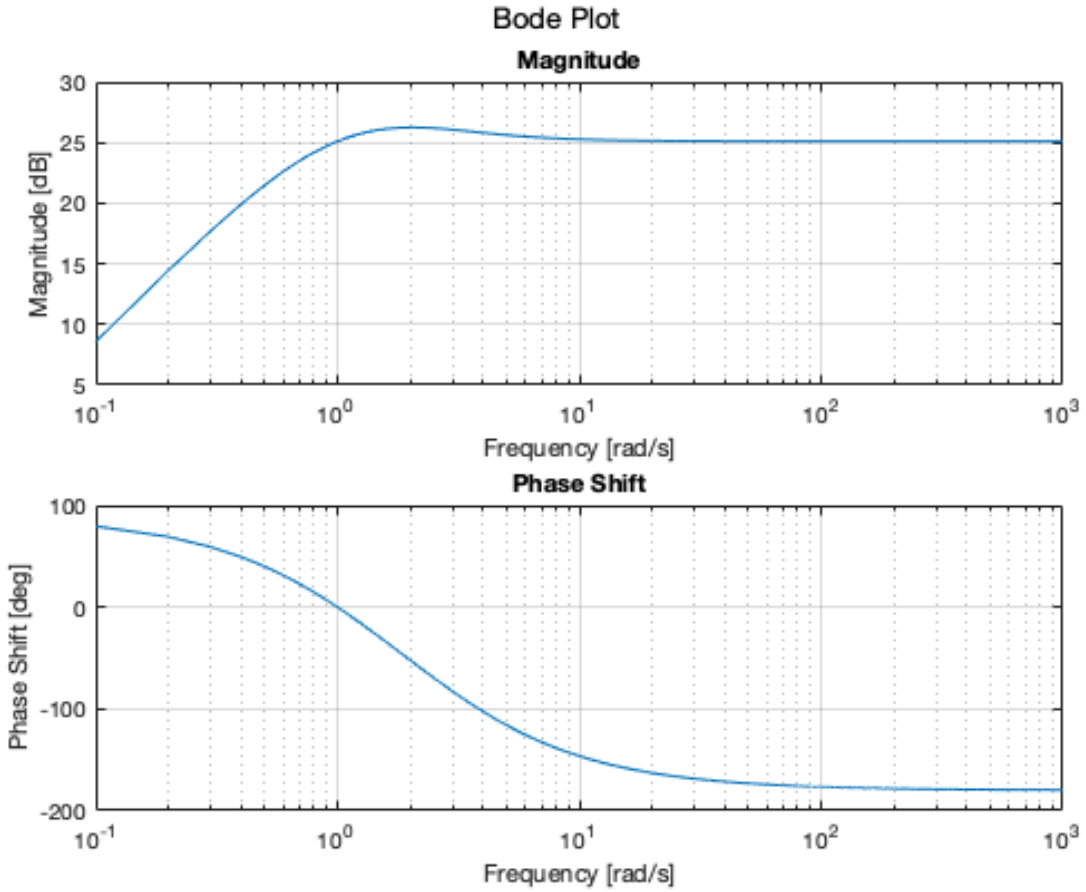
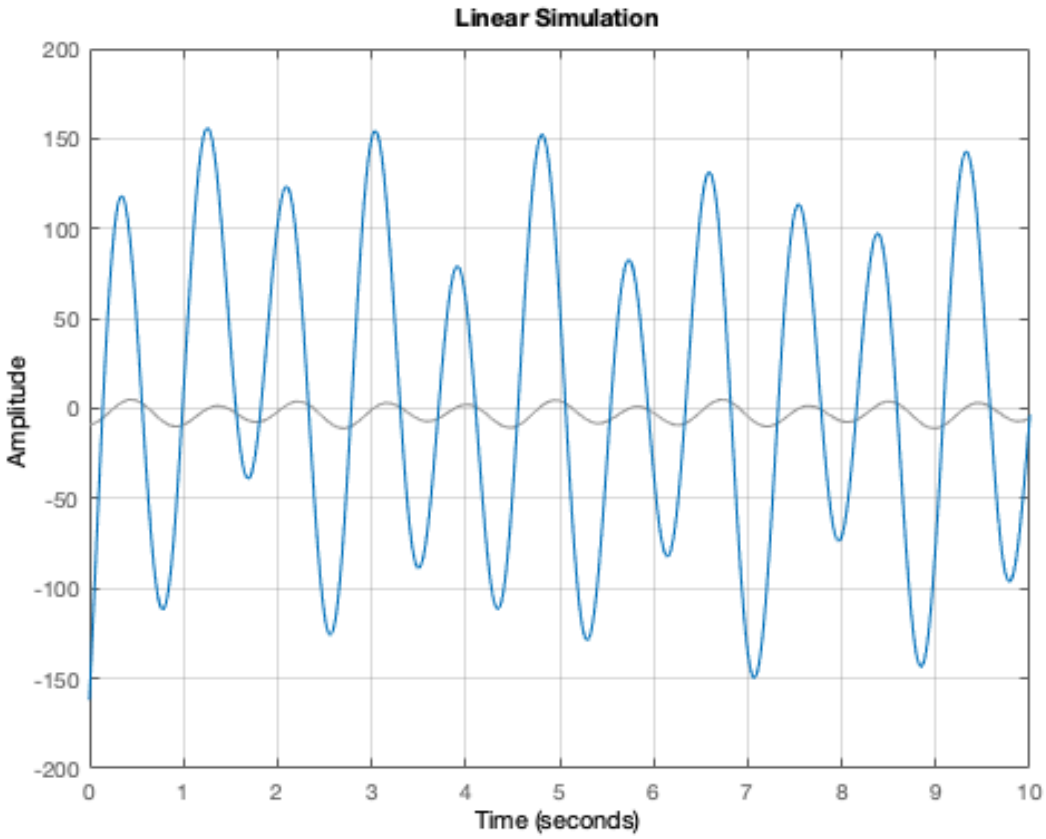
```
% aae 301 hw10 Nick Mondora
clc;
clear all;
```

question 1

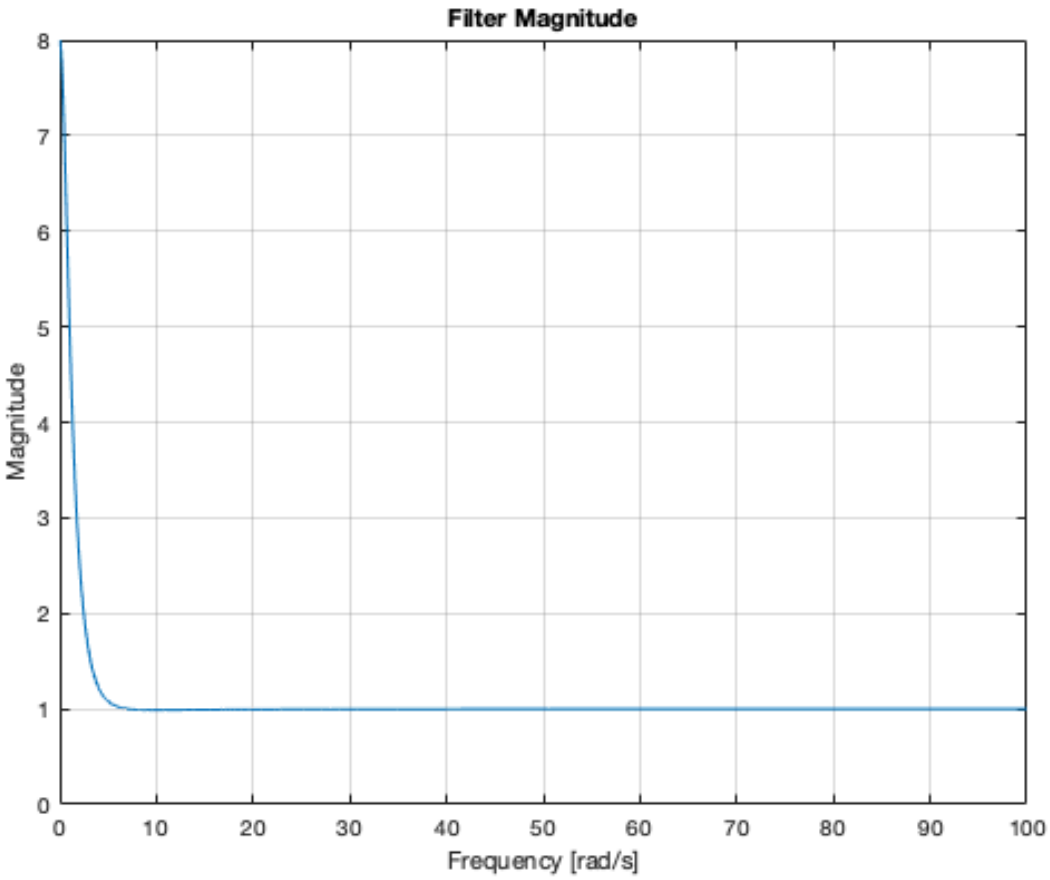
```
t = linspace(0, 10, 1000); %time
freq = linspace(0, 10^3, 10^4); %frequency

numerator = conv([18,0], [1,-3]);
denominator = conv([1,1], [1,2]);
s = tf(numerator, denominator);

input = -3 +2*sin(4*t) - 6*cos(7*t);

mag = 18 .* freq .* sqrt((freq.^2 + 9)./((freq.^2 + 1).*(freq.^2 + 4)));
anglee = pi/2 + atan(-1/3 * freq) - atan(freq) - atan(freq/2);

figure(1)
subplot(2,1,1)
semilogx(freq, 20*log10(mag))
xlabel("Frequency [rad/s]")
ylabel("Magnitude [dB]")
title("Magnitude")
grid on
subplot(2,1,2)
semilogx(freq, rad2deg(anglee))
xlabel("Frequency [rad/s]")
ylabel("Phase Shift [deg]")
title("Phase Shift")
grid on
sgtitle("Bode Plot")

figure(2)
lsim(s, input, t);
grid on
title("Linear Simulation")
```


Bode Plot
Magnitude
Magnitude [dB]
30
25
20
15
10
5
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
Frequency [rad/s]
Phase Shift
Phase Shift [deg]
100
0
-100
-200
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
Frequency [rad/s]



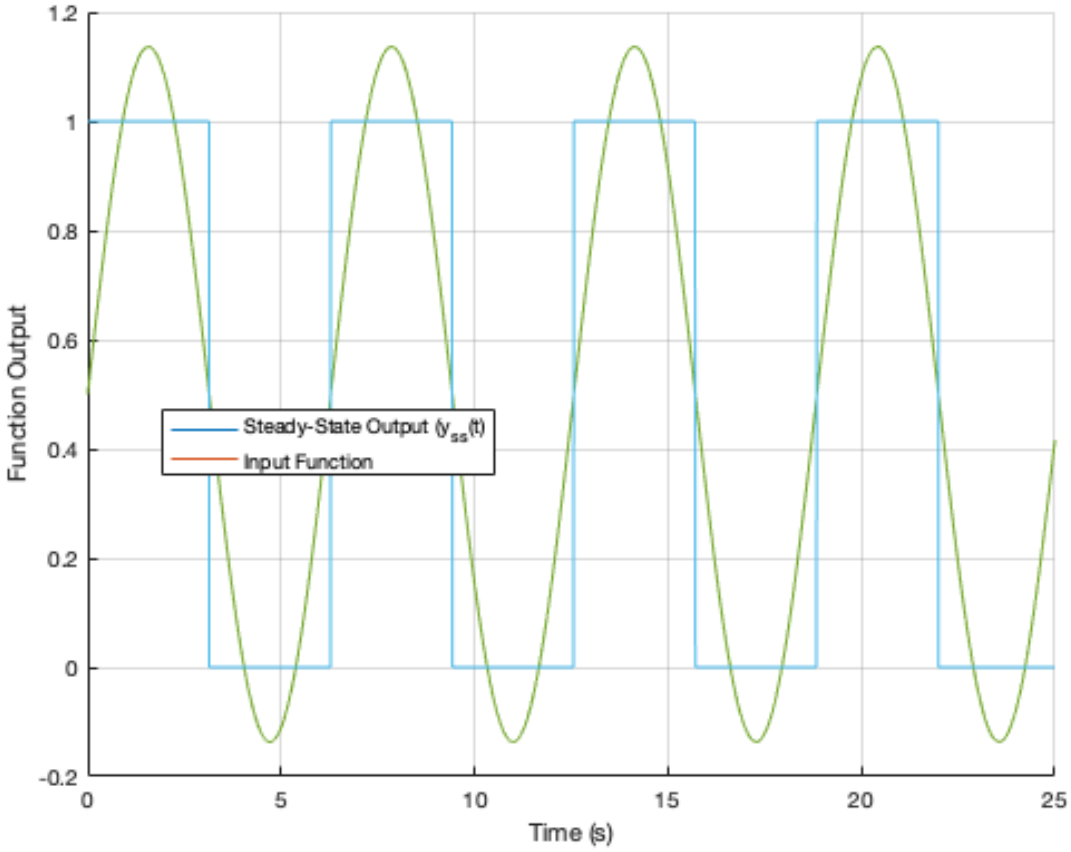
question 2

```
z = 16; % for w0 = 4
w = 0:.01:100;

mag = sqrt( (w.^4 + z.^2) ./ ( (1+w.^2) .* (4+w.^2)));

figure(3);
plot(w, mag);
grid on
xlabel("Frequency [rad/s]");
title("Filter Magnitude")
ylabel("Magnitude");
```



question 3

```
t = linspace(0, 25, 10^5); %time
input = ones(length(t), 1);
input(mod(t, 2*pi) > pi) = 0; % u(t)

output = (1/2) + (2/pi)*sin(t);

figure(4)
hold on
grid on
plot(t, output)
plot(t, input)
xlabel("Time (s)")
ylabel("Function Output")
legend(["Steady-State Output (y_{ss}(t)", "Input Function"], 'location', ...
    'best')
```



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