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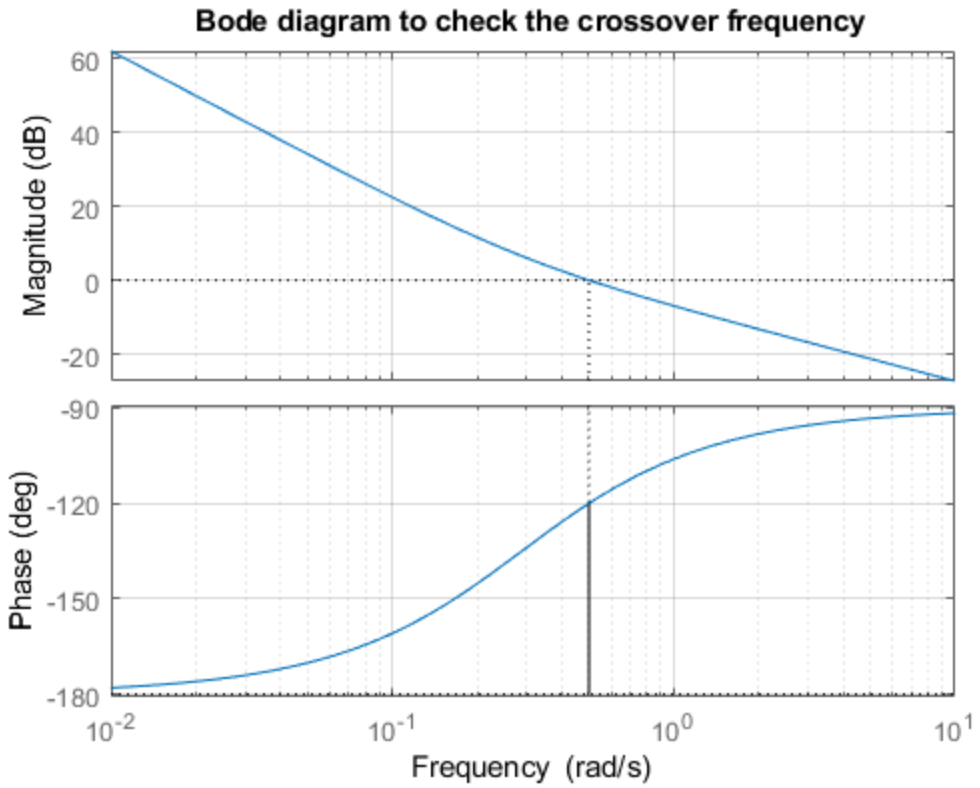
```
% Praful Sigdel
% Linear Control Theory HW#6
```

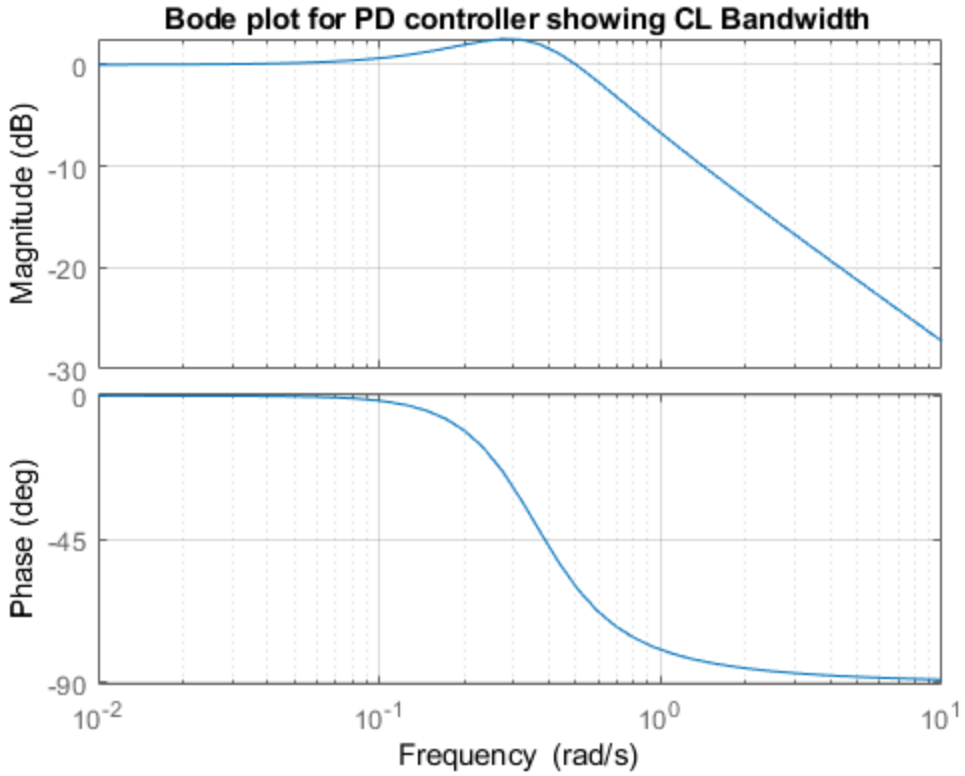
Problem 1B.

```
num = [0 0.125*3.46 0.125];
den = [1 0 0];
sys1 = tf(num, den);
figure
margin(sys1);
grid;
title('Bode diagram to check the crossover frequency');
```



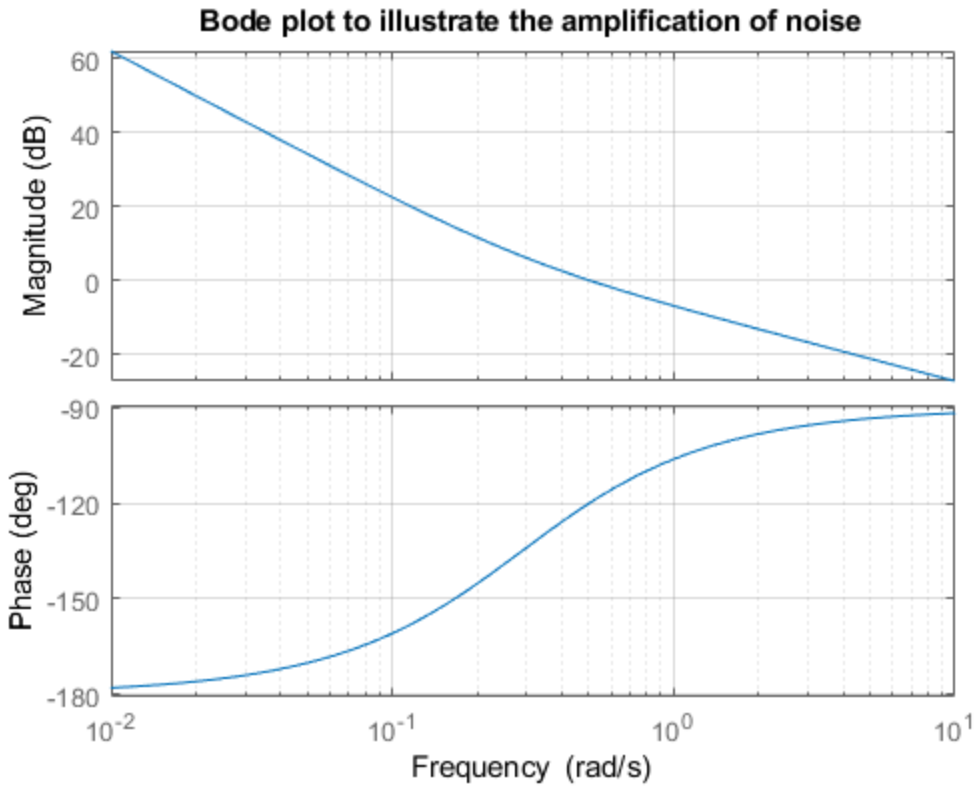
Problem 1C

```
num = [0 0.125*3.46 0.125];
den = [1 0 0];
sys1 = tf(num, den);
sys2 = tf(1,1);
Gc1 = feedback(sys1, sys2);
figure
bode(Gc1);
grid;
title('Bode plot for PD controller showing CL Bandwidth');
```



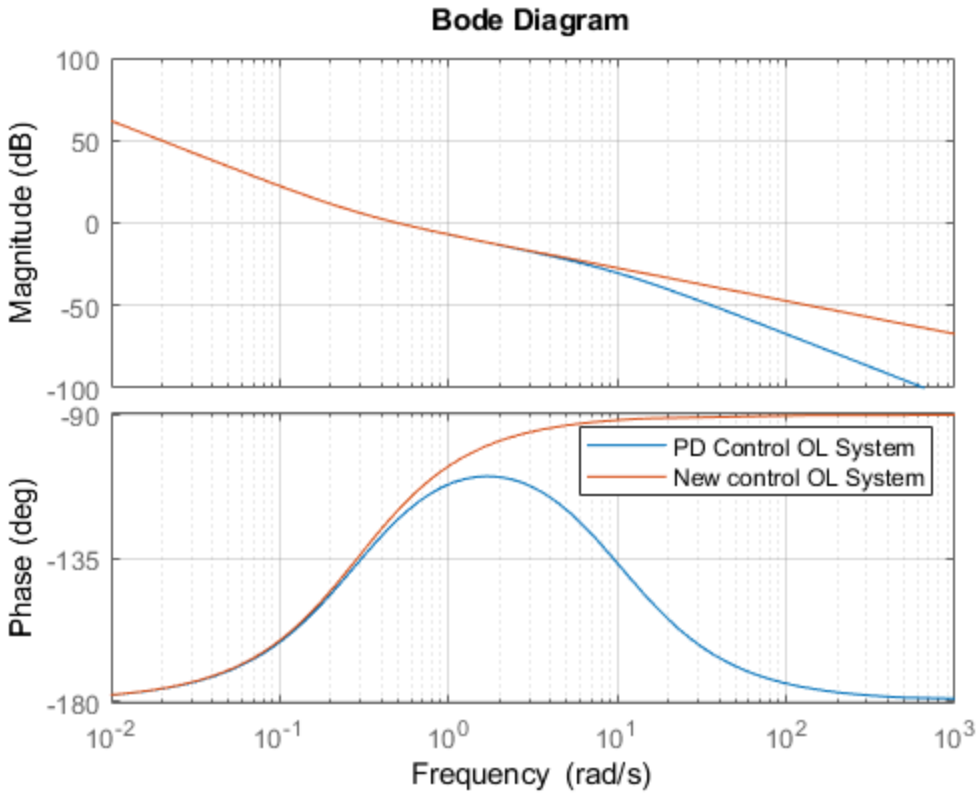
Problem 1D

```
num = [0 0.125*3.46 0.125];
den = [1 0 0];
sys = tf(num, den);
figure
bode(sys);
grid
title('Bode plot to illustrate the amplification of noise')
```



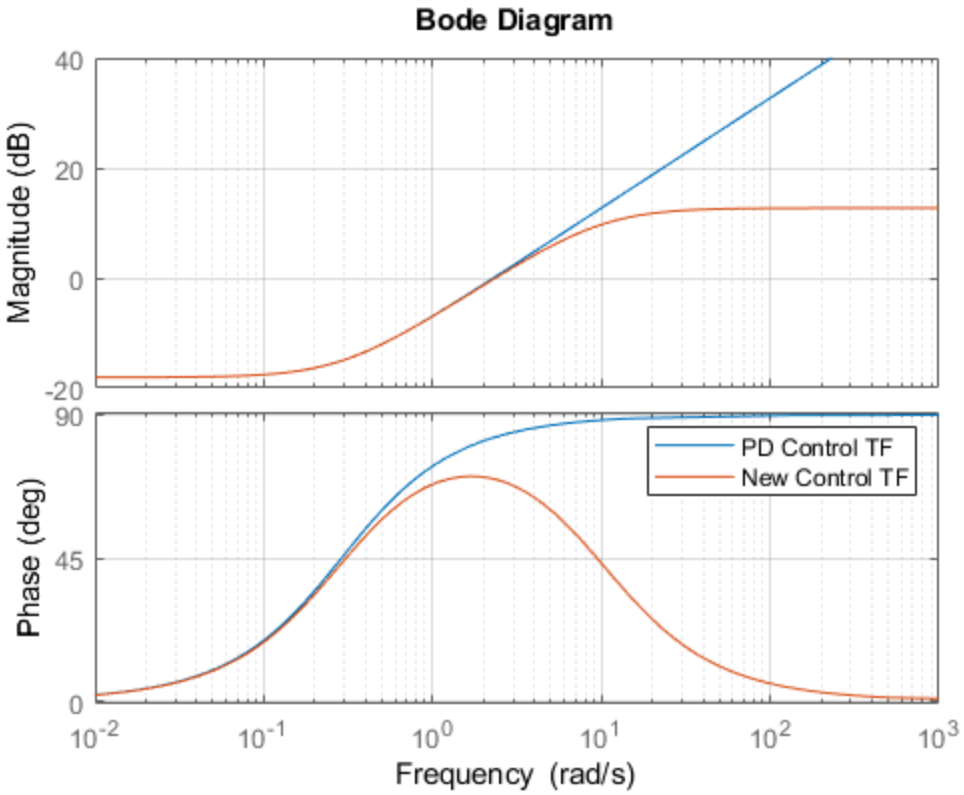
Problem 1Eb

```
num = [0 0.125*3.46 0.125];
den = [1 0 0];
sys1 = tf(num, den);
Gp = (tf([0.125*3.46 0.125],[0.1 1]));
Gc = tf([0 0 1], [1 0 0]);
Gol = Gp * Gc;
figure
bode(Gol)
hold on
bode(sys1)
grid
hold off
legend({'PD Control OL System', 'New control OL System'},'Location', ...
    'northeast')
```



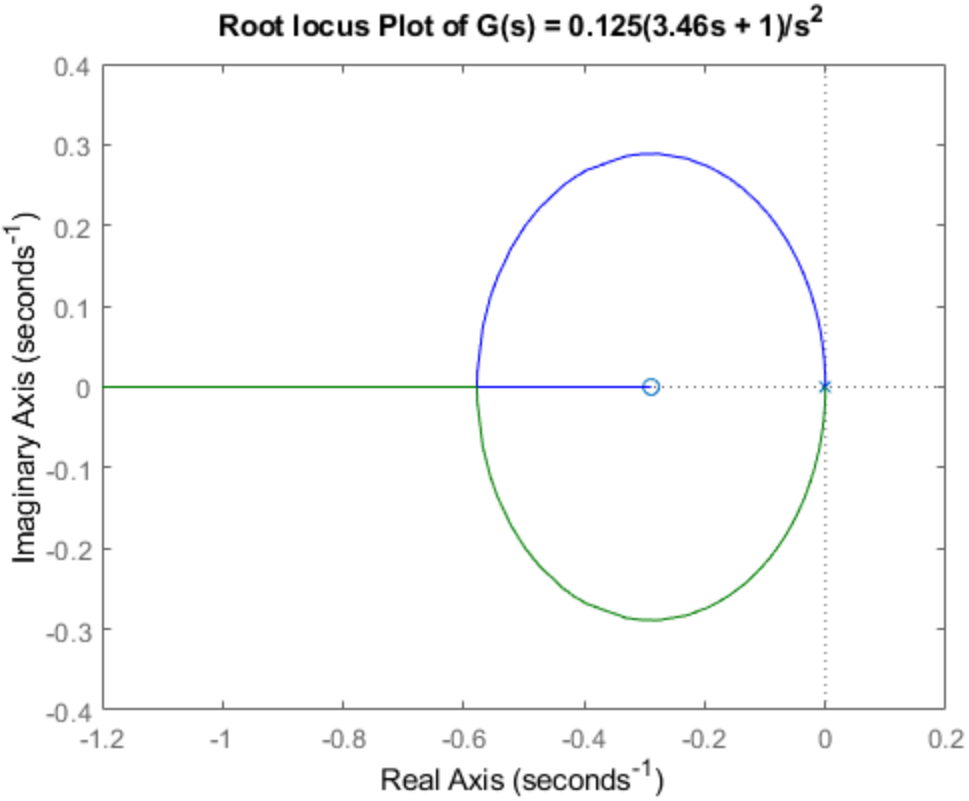
Problem 1Ea

```
num = [0.125*3.46 0.125];
den = [0 1];
sys_cont_1 = tf(num, den);
num1 = [0.125*3.46 0.125];
den1 = [0.1 1];
sys_cont_2 = tf(num1, den1);
figure
bode(sys_cont_1)
hold on
bode(sys_cont_2)
hold off
grid
legend('PD Control TF', 'New Control TF')
```



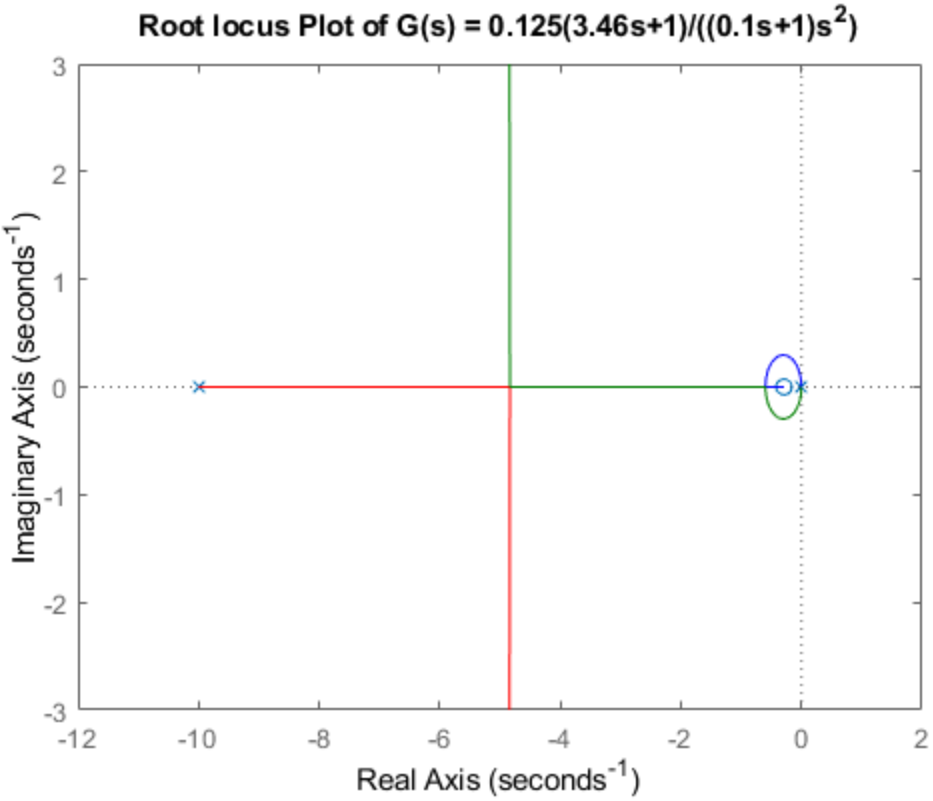
Problem 1Fa

```
num = [0 0.125*3.46 0.125];
den = [1 0 0];
figure
rlocus(num,den);
title('Root locus Plot of G(s) = 0.125(3.46s + 1)/s^2');
```



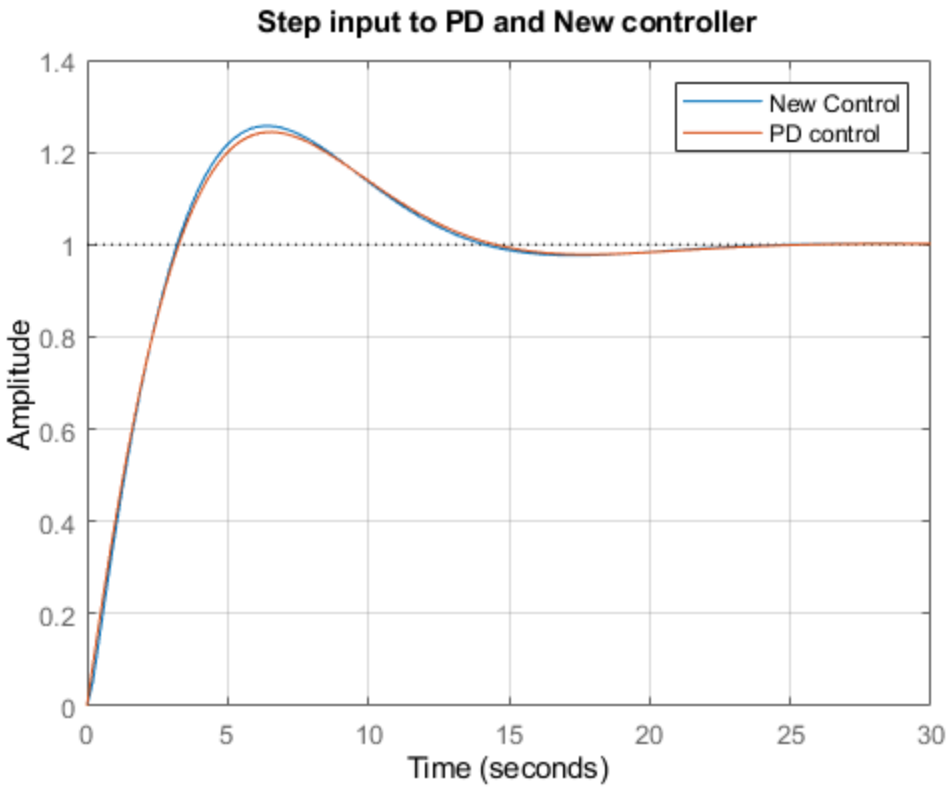
Problem 1Fb

```
num = [0 0.125*3.46 0.125];
den = conv([0 0.1 1],[1 0 0]);
figure
rlocus(num, den);
title('Root locus Plot of G(s) = 0.125(3.46s+1)/((0.1s+1)s^2)')
```



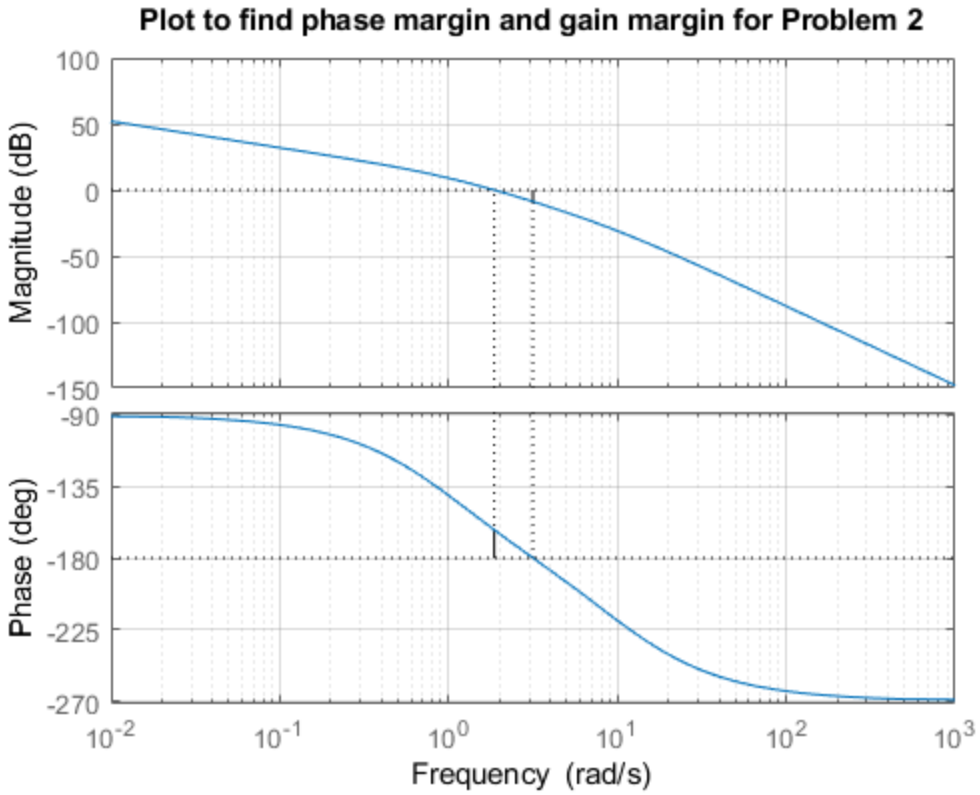
Problem 1G

```
num1 = [0 0 0.4325 0.125];
den1 = [1 0.4325 0.125];
den2 = [0.1 1 0.4325 0.125];
figure
step(num1, den2);
hold on
step(num1, den1);
hold off
grid
title('Step input to PD and New controller')
legend('New Control', 'PD control');
```



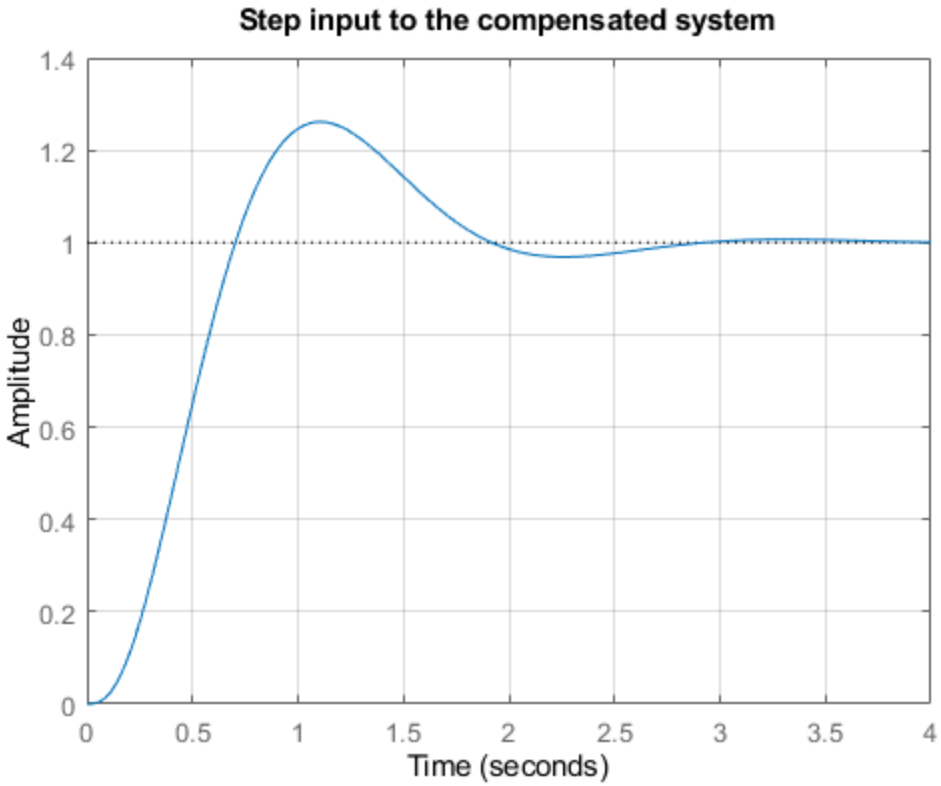
Problem 2

```
num = 40;
den = conv([1 10 0],[1 1]);
sys = tf(num, den);
figure
margin(sys)
grid
title('Plot to find phase margin and gain margin for Problem 2')
```



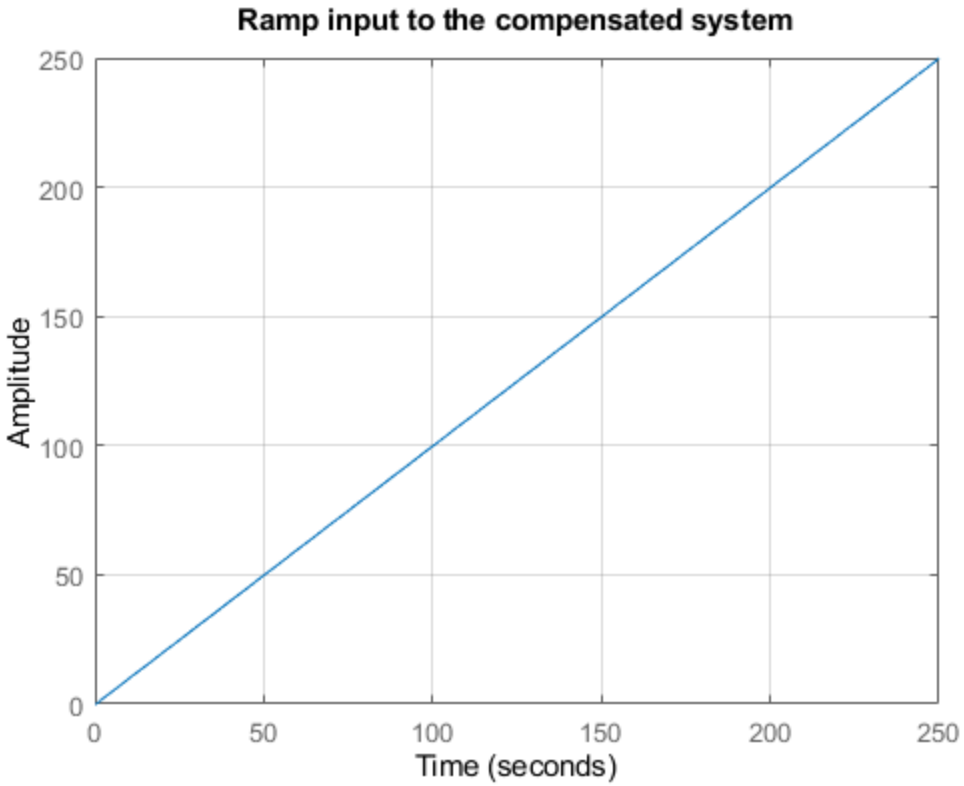
Problem 2 step response

```
num = 166.67 * [1 1.54];
den = conv([1 10 0],conv([1 1],[1 6.42]));
sys = tf(num, den);
f_sys = feedback(sys, 1);
figure
step(f_sys)
grid
title('Step input to the compensated system');
```



Problem 2 ramp response

```
num = 166.67 * [0 0 0 0 1 1.54];
den = [1 17.42 80.62 230.87 256.6718 0];
sys = tf(num, den);
figure
step(sys)
grid
title('Ramp input to the compensated system');
```



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