Matlab Code

```
% Hunter Phillips
% Homework 8
% MAE 488
% 04/02/19

clc
clear
format compact

%% Header
d_bullets = repmat('*', 50, 1); % concise way to make a lot of chars
fprintf('%c',d_bullets)
fprintf('\nMAE 488, Homework #8, Spring 2019, Hunter Phillips\n')
fprintf('%c',d_bullets)
fprintf('\n\n')

clear

%% Problem 29 Plots

f1 = figure(1);
hold on

% w(t)

% Part 1
kI = 160;
k2 = 34;
fun = tf([kI],[2 (2+k2), kI]);
[y1,x1] = step(fun,1.25);
info_1 = stepinfo(fun)
plot(x1,y1,'b')

% Part 2;
kI = 400;
k2 = 58;
fun = tf([kI],[2 (2+k2), kI]);
[y2,x2] = step(fun,1.25);
info_2 = stepinfo(fun)
plot(x2,y2,'g')

kI = 1000;
k2 = 118;
fun = tf([kI],[2 (2+k2), kI]);
[y3,x3] = step(fun,1.25);
info_3 = stepinfo(fun)
plot(x3,y3,'m')

ylim([0 1.2])
xlim([0 1.25])

ylabel('\omega(t)','FontSize', 18)
xlabel('t','interpreter','tex','FontSize', 18)
title({'MAE 488, Homework 8, Problem 10.29 Part (b)1'},'interpreter','latex','FontSize',16)

legend('s=-10,-8','s=-10,-20','s=-10,-50','location','southeast','fontsize',16)
grid

% print(f1,'..\results\problem_10_29_1.png','-dpng','-r1200');

% T

f2 = figure(2);
hold on
grid

% Part 1
kI = 160;
k2 = 34;
fun = tf([(2*kI) (2*kI)],[2 (2+k2), kI]);
[y1,x1] = step(fun,1);
info_4 = stepinfo(fun)
plot(x1,y1,'r')
```

```
% Part 2
kI = 400;
k2 = 58;
fun = tf([(2*kI) (2*kI)],[2 (2+k2), kI]);
[y1,x1] = step(fun,1);
info_5 = stepinfo(fun)
plot(x1,y1,'g')

% Part 3
kI = 1000;
k2 = 118;
fun = tf([(2*kI) (2*kI)],[2 (2+k2), kI]);
[y1,x1] = step(fun,1);
info_6 = stepinfo(fun)
plot(x1,y1,'b')

ylabel('\tau(t)','FontSize', 18)
xlabel('t','interpreter','tex','FontSize', 18)
title({'MAE 488, Homework 8, Problem 10.29 Part (b)2'},'interpreter','latex','FontSize',16)

ylim([0 15])

legend('s=-10,-8','s=-10,-20','s=-10,-50','location','northeast','fontsize',16)

% print(f2,'..\results\problem_10_29_2.png','-dpng','-r1200');

%% Problem 73S

f3 = figure(3);

KP = 108;
KI = 200;
sim('hw8_73S.slx')

subplot(2,1,1),plot(tout,simout(:,2))
ylim([0 1.5])
ylabel('\omega(t)','FontSize', 18)
xlabel('t','interpreter','tex','FontSize', 18)
title({'MAE 488, Homework 8, Problem 10.73S'},'interpreter','latex','FontSize',16)
grid

subplot(2,1,2),plot(tout,simout(:,1),'r')
ylim([0,25])
ylabel('\tau(t)','FontSize', 18)
xlabel('t','interpreter','tex','FontSize', 18)
grid

% print(f3,'..\results\problem_10_73S.png','-dpng','-r1200');
```

Matlab Output

```
************************************************
MAE 488, Homework #8, Spring 2019, Hunter Phillips
************************************************


info_1 =
  struct with fields:

        RiseTime: 0.3789
    SettlingTime: 0.6602
     SettlingMin: 0.9033
     SettlingMax: 1.0000
       Overshoot: 0
      Undershoot: 0
            Peak: 1.0000
        PeakTime: 1.4909

info_2 =
  struct with fields:

        RiseTime: 0.2590
    SettlingTime: 0.4600
     SettlingMin: 0.9023
     SettlingMax: 0.9992
       Overshoot: 0
      Undershoot: 0
            Peak: 0.9992
        PeakTime: 0.7783
```

```
info_3 =
  struct with fields:

        RiseTime: 0.2273
    SettlingTime: 0.4135
     SettlingMin: 0.9016
     SettlingMax: 0.9992
       Overshoot: 0
      Undershoot: 0
            Peak: 0.9992
        PeakTime: 0.7350

info_4 =
  struct with fields:

        RiseTime: 0.0112
    SettlingTime: 0.7858
     SettlingMin: 2.0066
     SettlingMax: 7.1231
       Overshoot: 256.1553
      Undershoot: 0
            Peak: 7.1231
        PeakTime: 0.1266
```

```
info_5 =
  struct with fields:

        RiseTime: 0.0043
    SettlingTime: 0.5348
     SettlingMin: 2.0095
     SettlingMax: 10.5254
       Overshoot: 426.2693
      Undershoot: 0
            Peak: 10.5254
        PeakTime: 0.0737

info_6 =
  struct with fields:

        RiseTime: 0.0017
    SettlingTime: 0.4559
     SettlingMin: 2.0069
     SettlingMax: 13.7838
       Overshoot: 589.1883
      Undershoot: 0
            Peak: 13.7838
        PeakTime: 0.0424
```

Matlab Figures

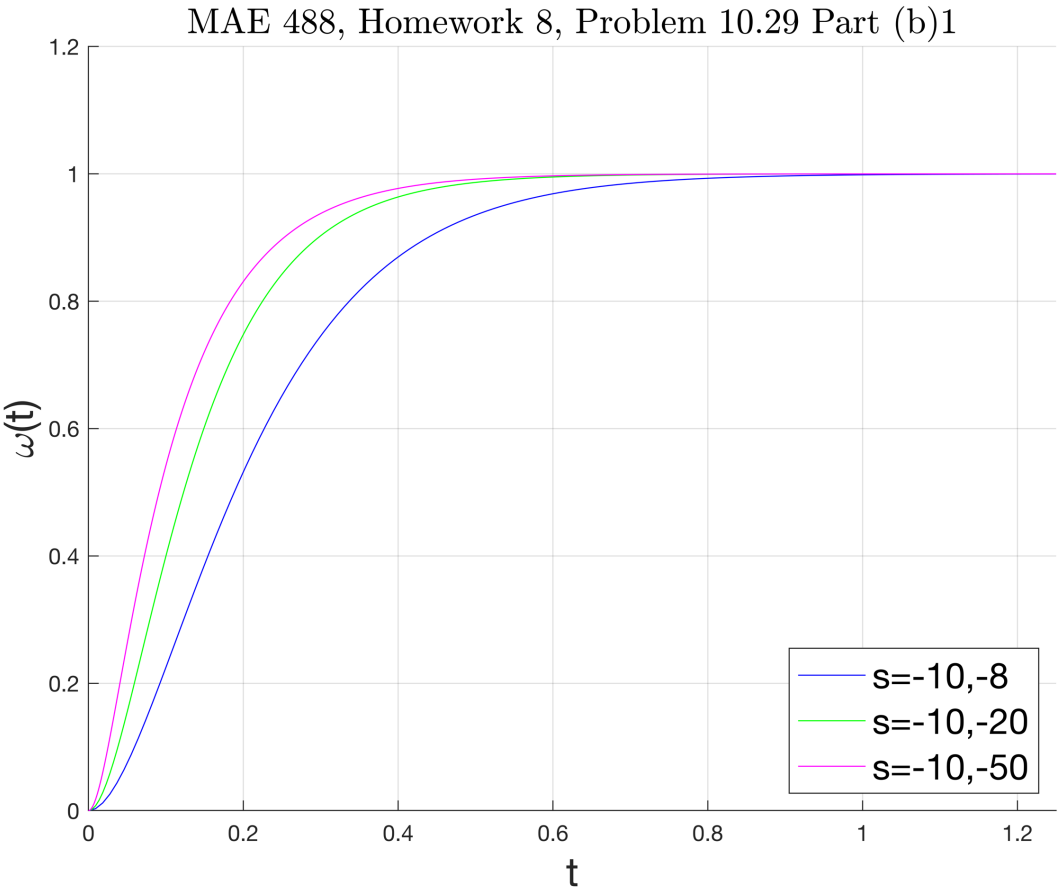


Figure 1: Problem 10.29 Part b(1)

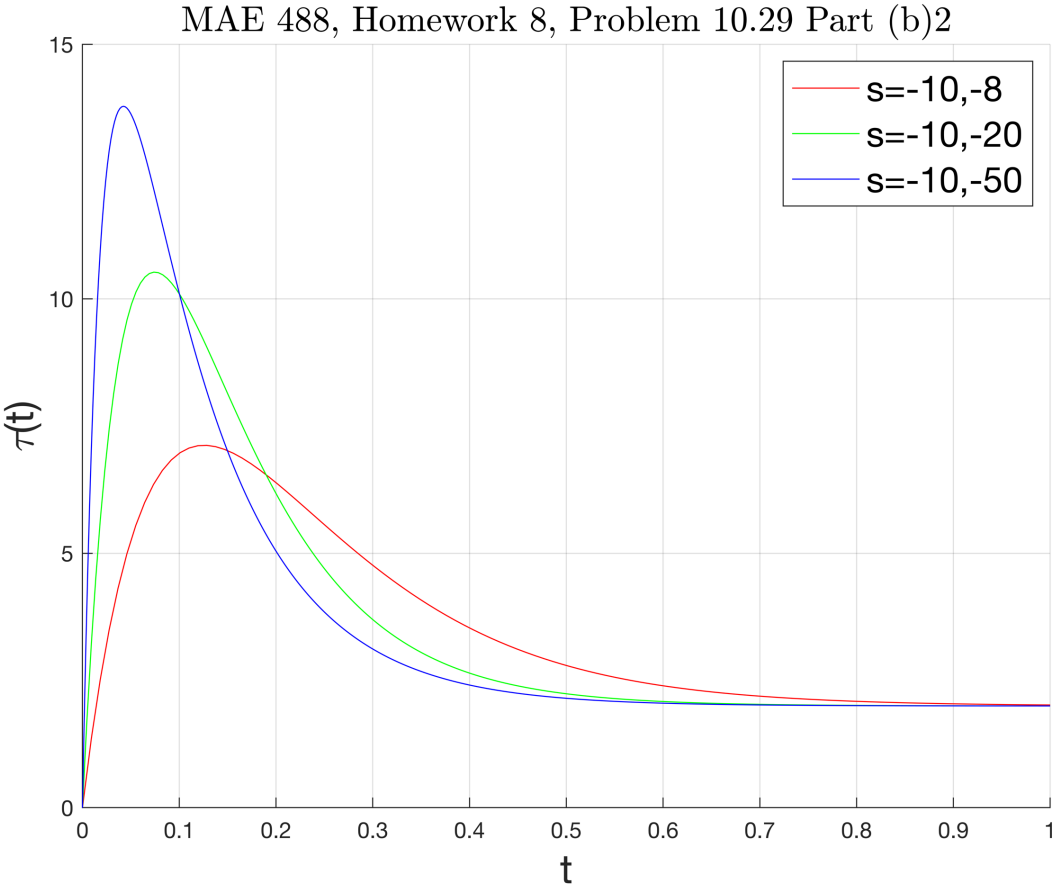


Figure 2: Problem 10.29 Part b(2)

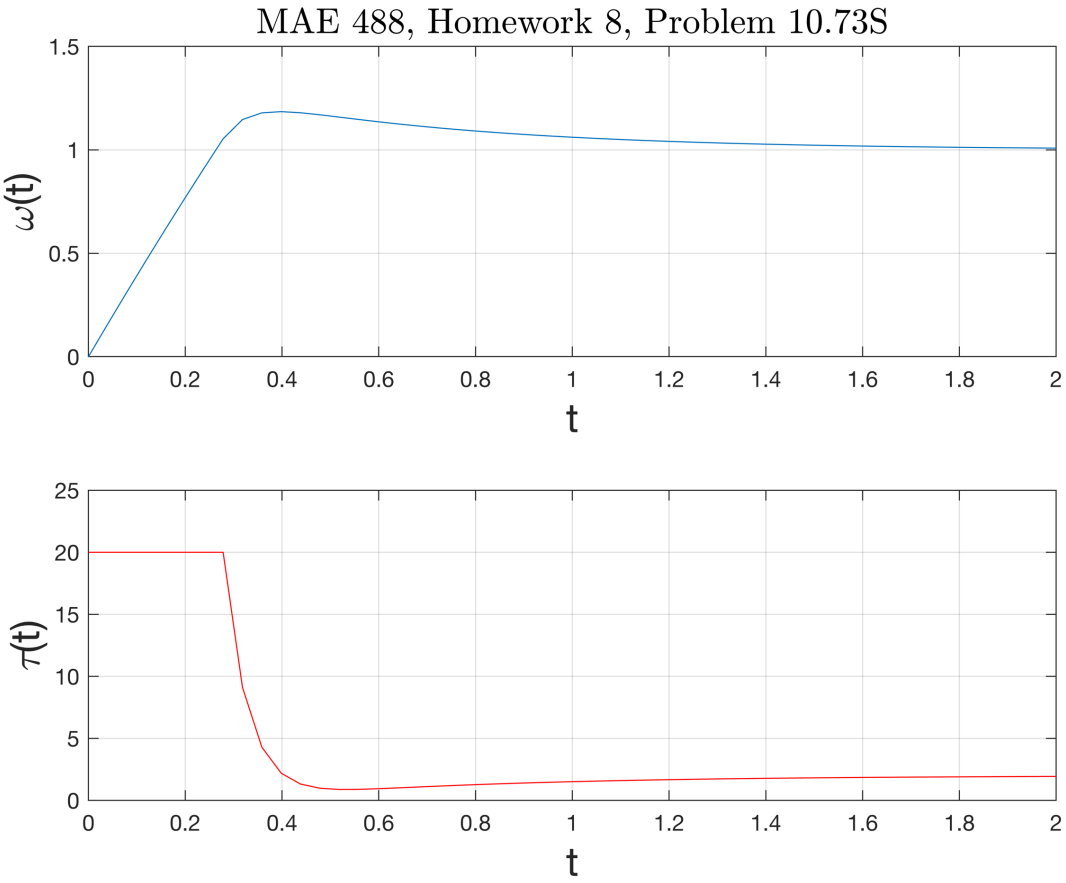
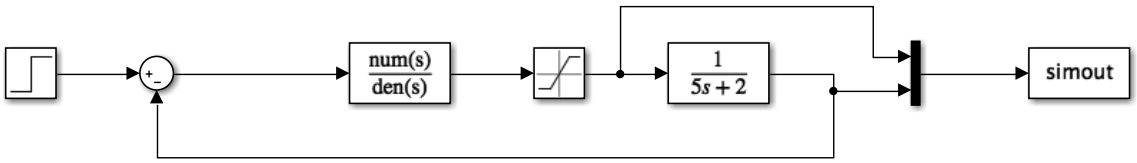


Figure 3: Problem 10.73S

Simulink Models



Problem 52.S