Contents

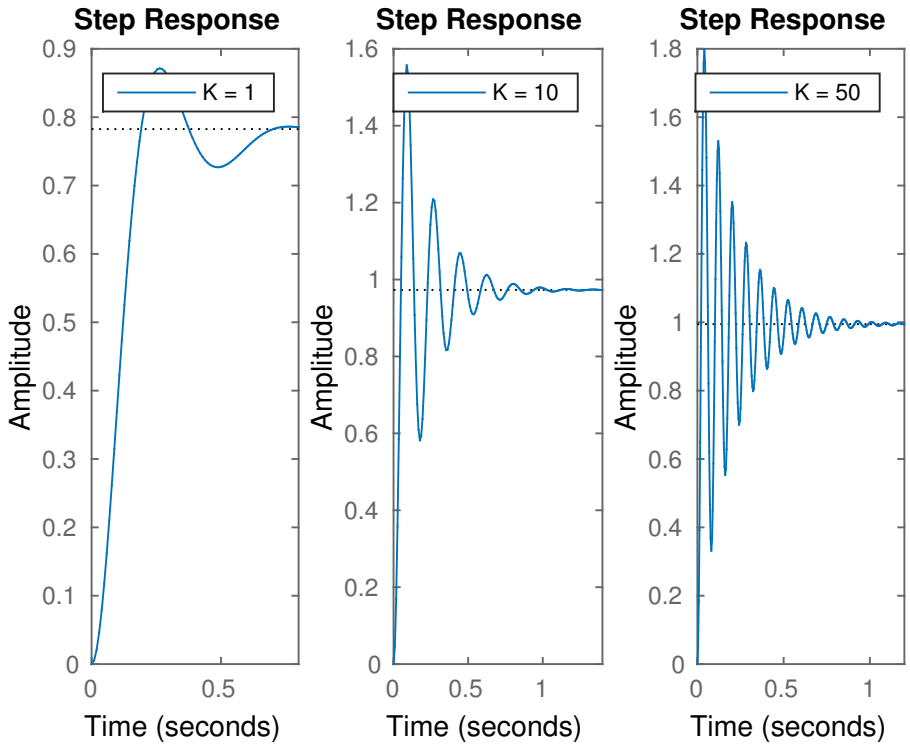
SD3 - D1

```
close all; clear all; clc;

% K = 1
num = [120 720];
den = [1 16 28+100+120 120*6+200];
t1 = tf(num, den)
subplot(1,3,1)
step(t1);
stepinfo(t1)
legend('K = 1')

% K = 10
num = [1200 7200];
den = [1 16 1328 7400];
t10 = tf(num, den)
subplot(1,3,2)
step(t10);
stepinfo(t10)
legend('K = 10')

% K = 50
num = [120*50 6*120*50];
den = [1 16 100+28+120*50 200+6*120*50];
t50 = tf(num, den)
subplot(1,3,3)
step(t50);
stepinfo(t50)
legend('K = 50')
```

```
t1 =

         120 s + 720
  -------------------------
  s^3 + 16 s^2 + 248 s + 920

Continuous-time transfer function.
```

```
ans =

        RiseTime: 0.1281
    SettlingTime: 0.6321
     SettlingMin: 0.7267
     SettlingMax: 0.8713
       Overshoot: 11.3331
      Undershoot: 0
            Peak: 0.8713
        PeakTime: 0.2632


t10 =

         1200 s + 7200
  ----------------------------
  s^3 + 16 s^2 + 1328 s + 7400

Continuous-time transfer function.


ans =

        RiseTime: 0.0335
    SettlingTime: 0.7336
     SettlingMin: 0.5820
     SettlingMax: 1.5570
       Overshoot: 60.0202
      Undershoot: 0
            Peak: 1.5570
        PeakTime: 0.0882


t50 =

         6000 s + 36000
  ----------------------------
  s^3 + 16 s^2 + 6128 s + 36200

Continuous-time transfer function.


ans =

        RiseTime: 0.0141
    SettlingTime: 0.7715
```

```
SettlingMin: 0.3319
SettlingMax: 1.7972
  Overshoot: 80.7223
 Undershoot: 0
       Peak: 1.7972
   PeakTime: 0.0403
```

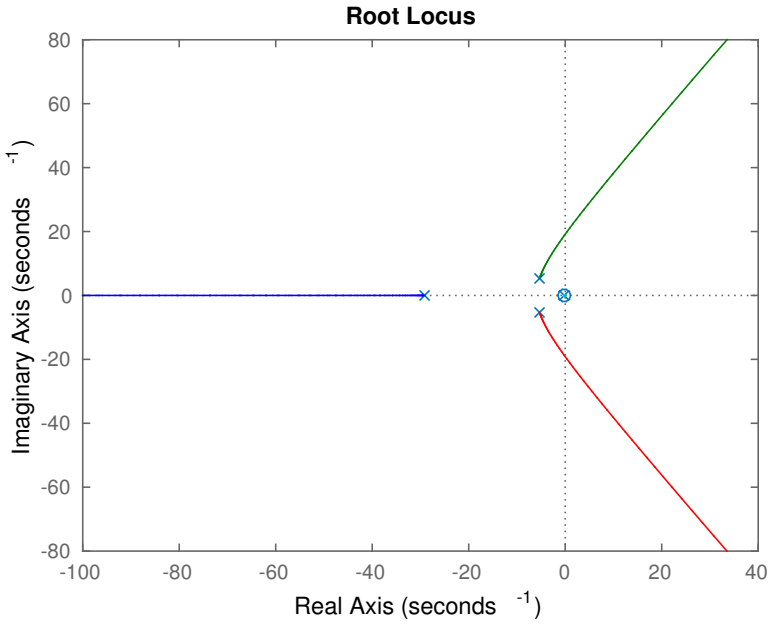


SD3 - D2a

```
close all; clear all; clc;
k1 = 4.6;
%k1 = 4.57;
num = [375*k1 75*k1];
den = [1 40 375 375*k1 75*k1];

%num = [375*k1 0];
%den = [1 40 375 375*k1 0];

sys = tf(num,den);
damp(sys)
figure(1)
```

```
rlocus(sys)
stepinfo(sys)
```

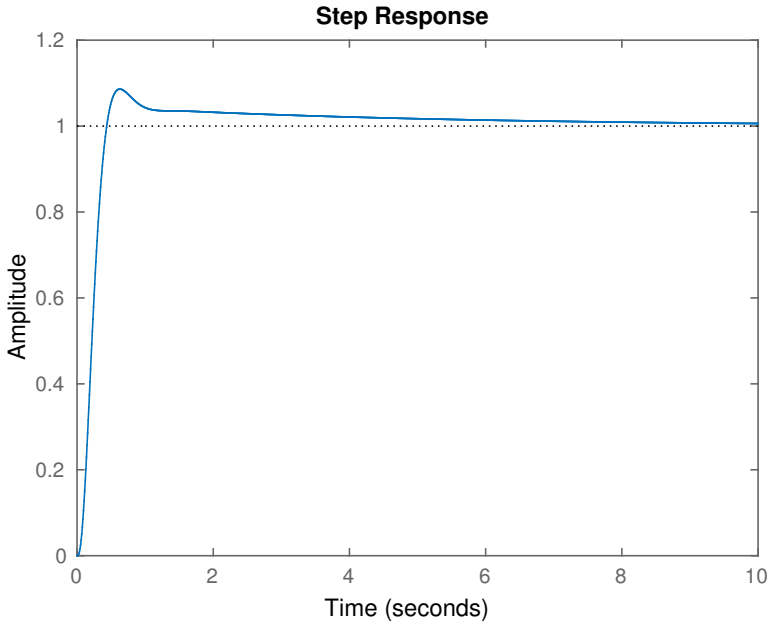
```
          Pole                Damping        Frequency      Time Constant
                                           (rad/seconds)      (seconds)

 -2.09e-01                  1.00e+00        2.09e-01          4.78e+00
 -5.32e+00 + 5.31e+00i      7.07e-01        7.52e+00          1.88e-01
 -5.32e+00 - 5.31e+00i      7.07e-01        7.52e+00          1.88e-01
 -2.92e+01                  1.00e+00        2.92e+01          3.43e-02

ans =

        RiseTime: 0.2749
    SettlingTime: 4.2600
     SettlingMin: 0.9079
     SettlingMax: 1.0861
       Overshoot: 8.6050
      Undershoot: 0
            Peak: 1.0861
        PeakTime: 0.6320
```



SD3 - 2b

```
stepinfo(sys);
```

```
step(sys);
```


Step Response
Amplitude
Time (seconds)
0
0.2
0.4
0.6
0.8
1
1.2
0
2
4
6
8
10