```
clc;
clearvars;
close all;
```

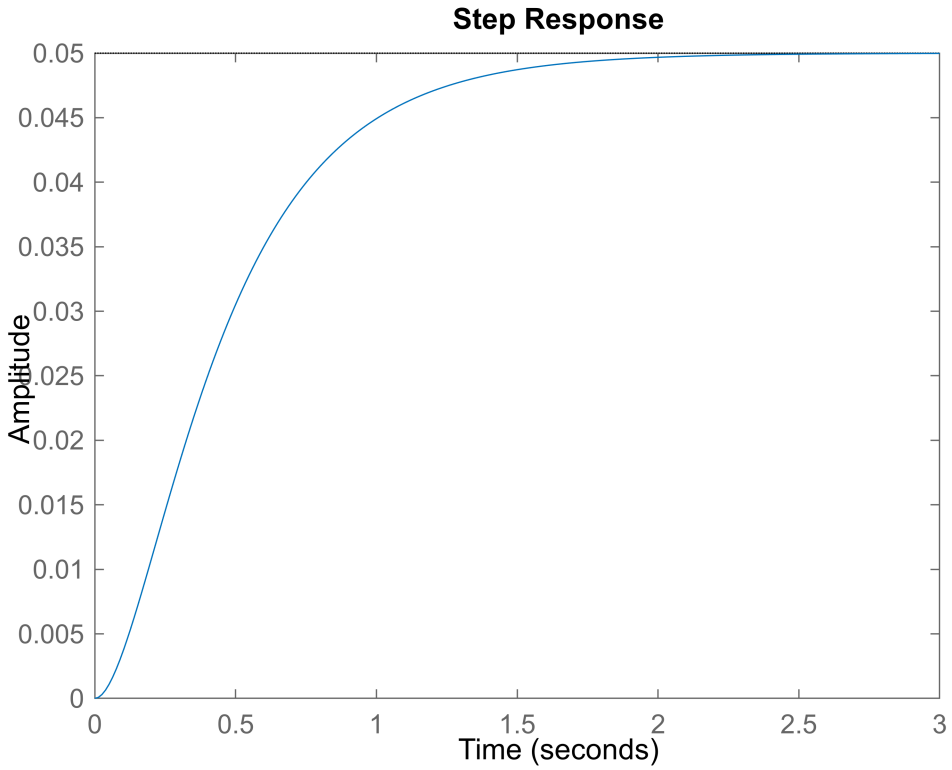
```
% P1
num = [0 0 1];
den = [1 10 20];
sys = tf(num, den);
sys
```

```
sys =

        1
  ---------------
  s^2 + 10 s + 20

Continuous-time transfer function.
```

```
% Open-Loop step response
step(sys)
```



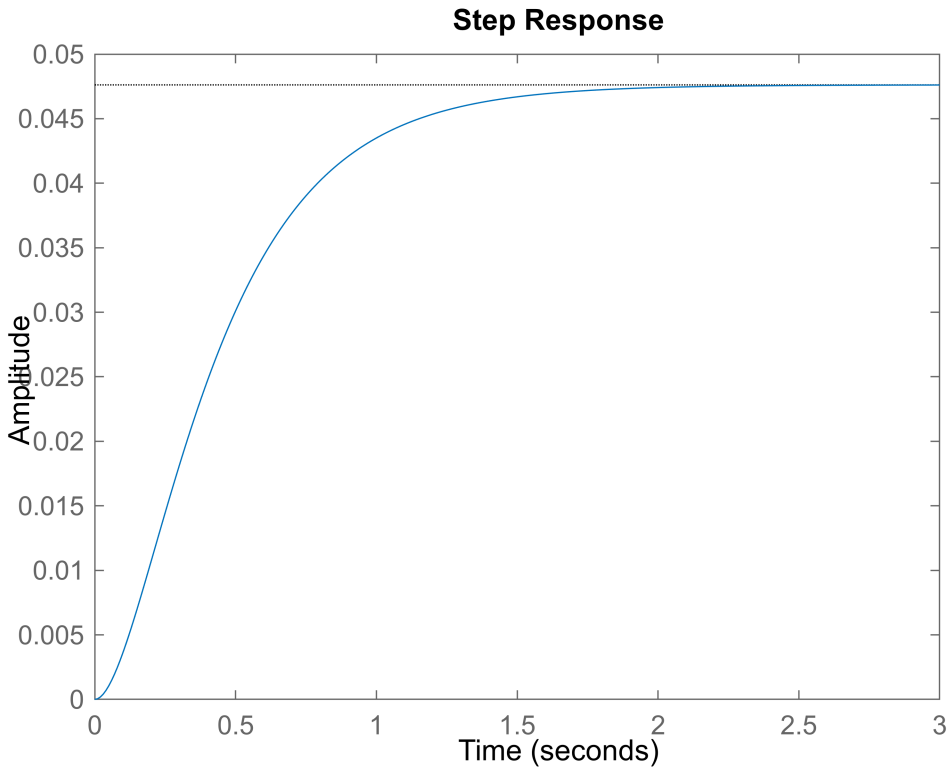

```
% P2
P2 = feedback(sys, 1);
P2
```

```
P2 =
```

```
        1
  ---------------
  s^2 + 10 s + 21
```

Continuous-time transfer function.

```
t=0:0.01:3;
% Closed-Loop step response
step(P2,t)
```




```
% P3: PROPORTIONAL CONTROL
Kp = 300;
C = pid(Kp)
```

```
C =

  Kp = 300

P-only controller.
```

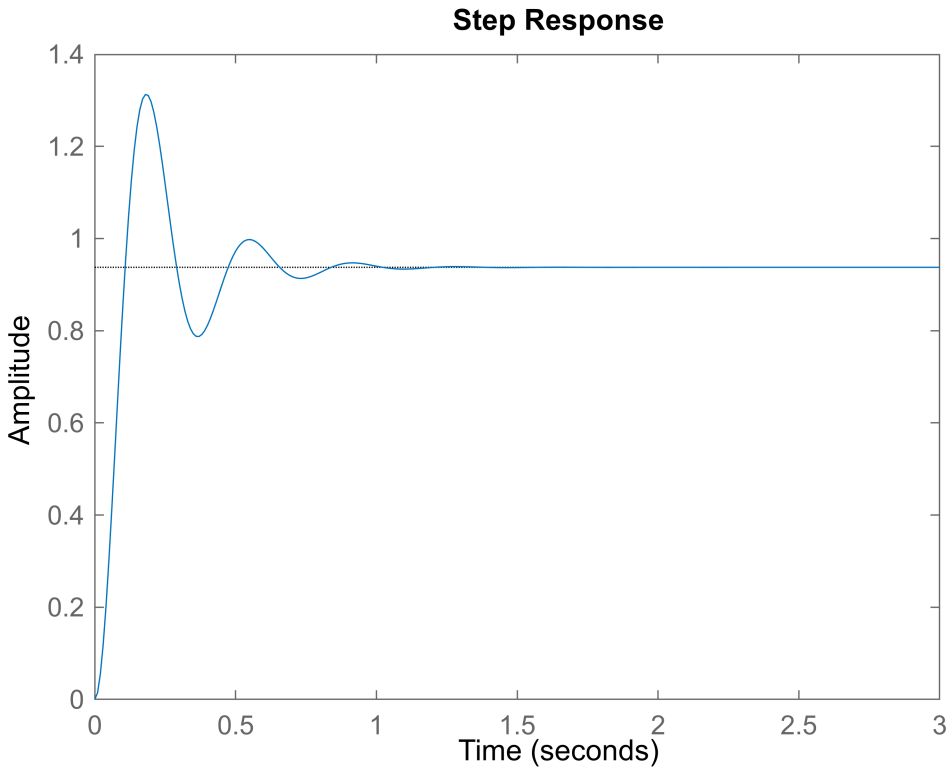
```
P3 = feedback(C*sys, 1);
P3
```

```
P3 =

        300
  ----------------
  s^2 + 10 s + 320
```

```
Continuous-time transfer function.
```

```
% Closed-Loop step response
t = 0:0.01:3;
step(P3,t)
```



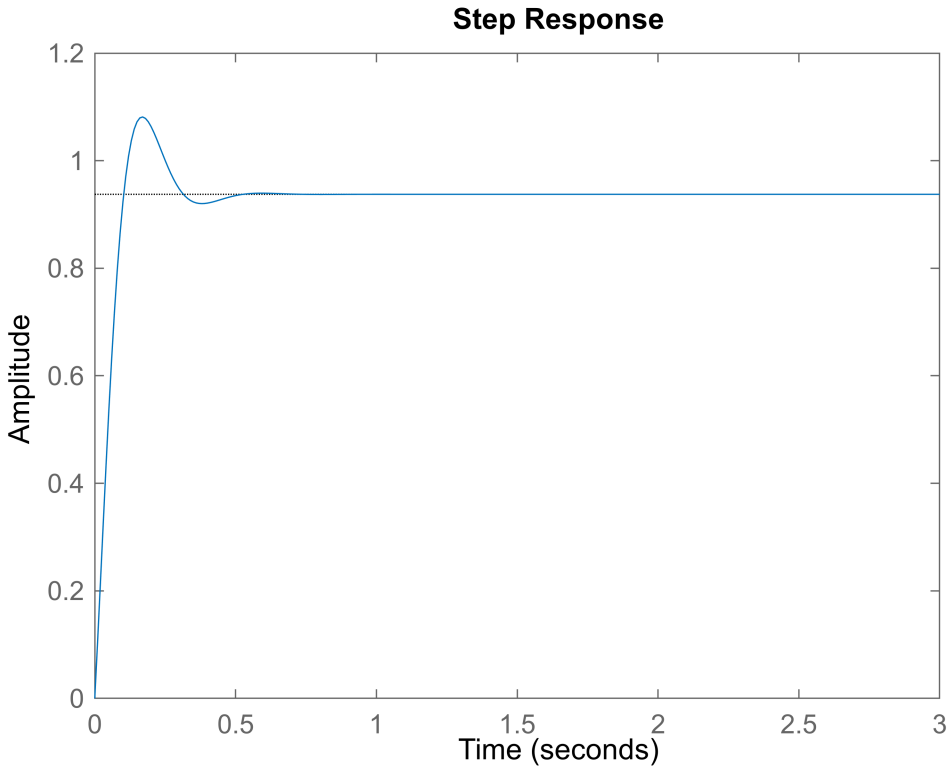

```
% P4: PROPORTIONAL-DERIVATIVE CONTROL
Kp = 300;
Kd = 10;
C = pid(Kp,0,Kd);
P4 = feedback(C*sys, 1);
P4
```

```
P4 =

     10 s + 300
  ----------------
  s^2 + 20 s + 320

Continuous-time transfer function.
```

```
% Closed-Loop step response
t = 0:0.01:3;
step(P4,t)
```



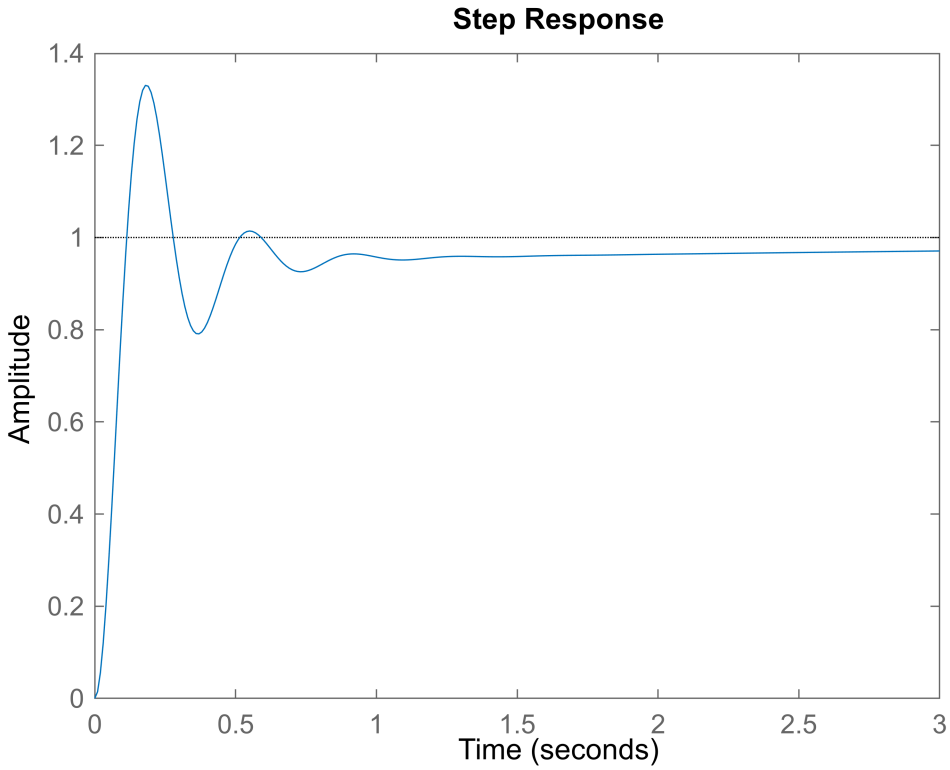

```
% P5: PROPORTIONAL-INTEGRAL CONTROL
Kp = 300;
Ki = 70;
C = pid(Kp,Ki,0);
P5 = feedback(C*sys, 1);
P5
```

```
P5 =

         300 s + 70
  -------------------------
  s^3 + 10 s^2 + 320 s + 70

Continuous-time transfer function.
```

```
% Closed-Loop step response
t = 0:0.01:3;
step(P5,t)
```



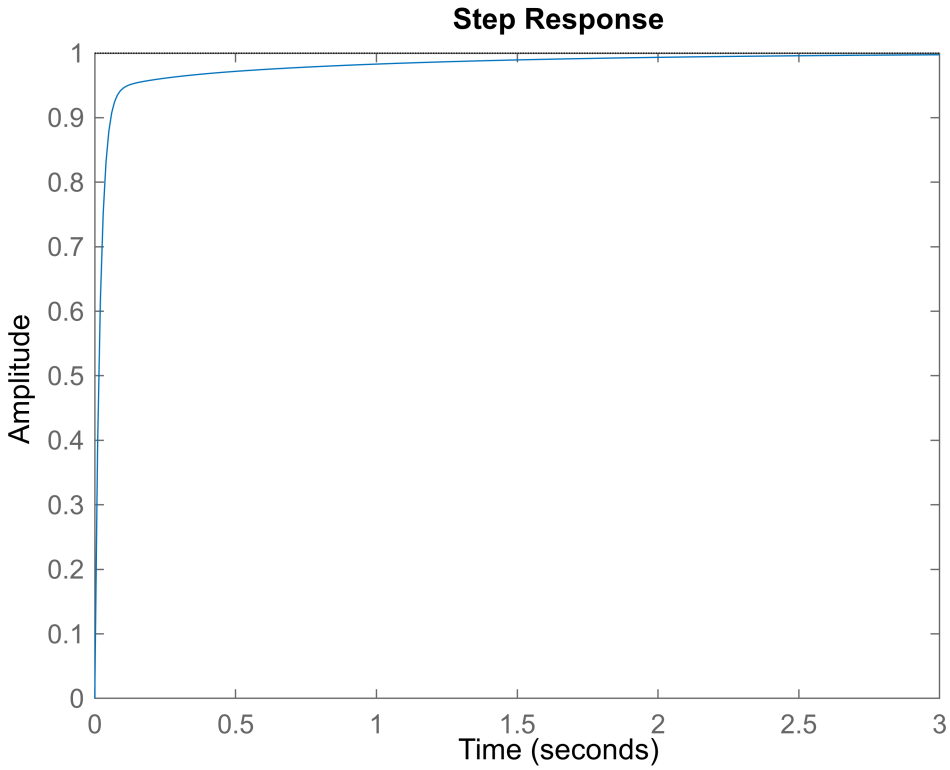

```
% P6: PROPORTIONAL-INTEGRAL-DERIVATIVE CONTROL
Kp = 350;
Ki = 300;
Kd = 50;
C = pid(Kp,Ki,Kd);
P6 = feedback(C*sys, 1);
P6
```

```
P6 =

     50 s^2 + 350 s + 300
  --------------------------
  s^3 + 60 s^2 + 370 s + 300

Continuous-time transfer function.
```

```
% Closed-Loop step response
t = 0:0.01:3;
step(P6,t)
```


Step Response
Amplitude
Time (seconds)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.5
1
1.5
2
2.5
3