```
s = tf('s')
```

```
s =

  s

Continuous-time transfer function.
```

Plant transfer function.

```
G = 100/(s*(s+1)*(s+10))
```

```
G =

         100
  -------------------
  s^3 + 11 s^2 + 10 s

Continuous-time transfer function.
```

Calculate the phase of the system at 5 rad/s to add a lead compensator.

```
[mag,phase,wout,sdmag,sdphase] = bode(G,5)
```

```
mag = 0.3508
phase = -195.2551
wout = 5
sdmag =

     []


sdphase =

     []
```

Lead compensator transfer function is now obtained which will provide the desired phase margin.

```
K = lead(75.2251,5)
```

```
K =

  s + 0.6483
  ----------
  s + 38.56

Continuous-time transfer function.
```

New transfer function is now obtained which has the desired phase margin.

```
L = K*G/0.0455
```

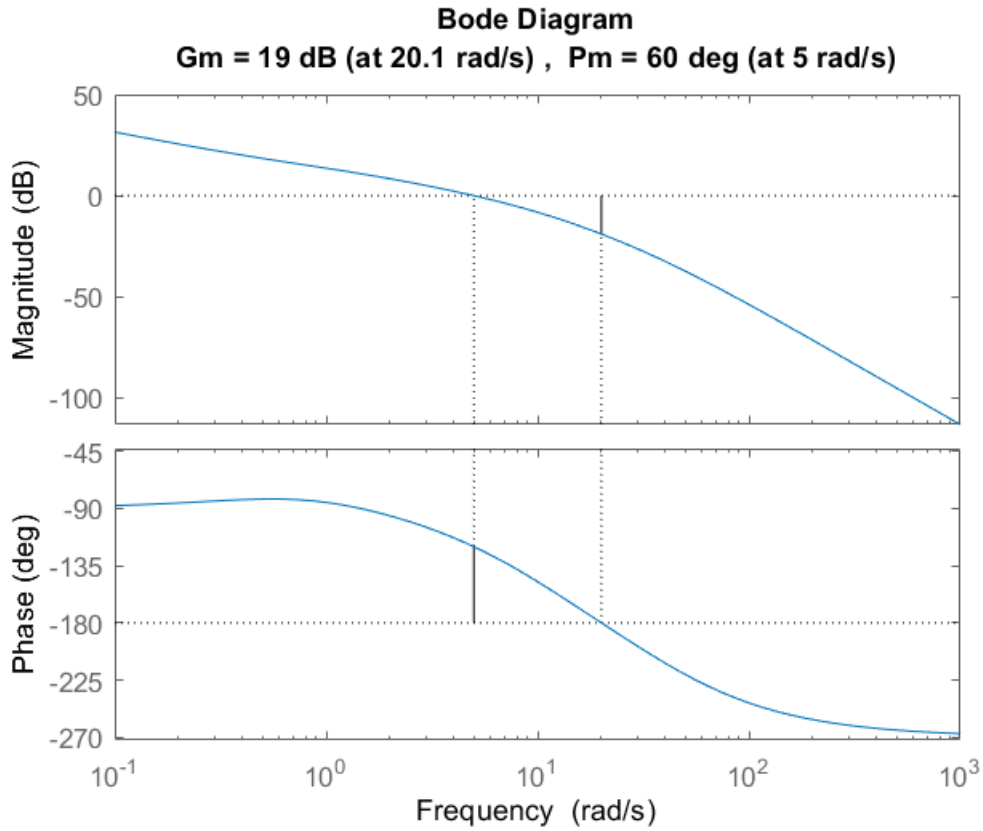
```
L =

                100 s + 64.83
  ------------------------------------------
  0.0455 s^4 + 2.255 s^3 + 19.76 s^2 + 17.55 s

Continuous-time transfer function.
```

Next, we calculate the magnitude at the desired cross-over frequency to provide an offset to the magnitude plot to achive the desired preformance.

```
[mag,phase,wout,sdmag,sdphase] = bode(L,5)
```

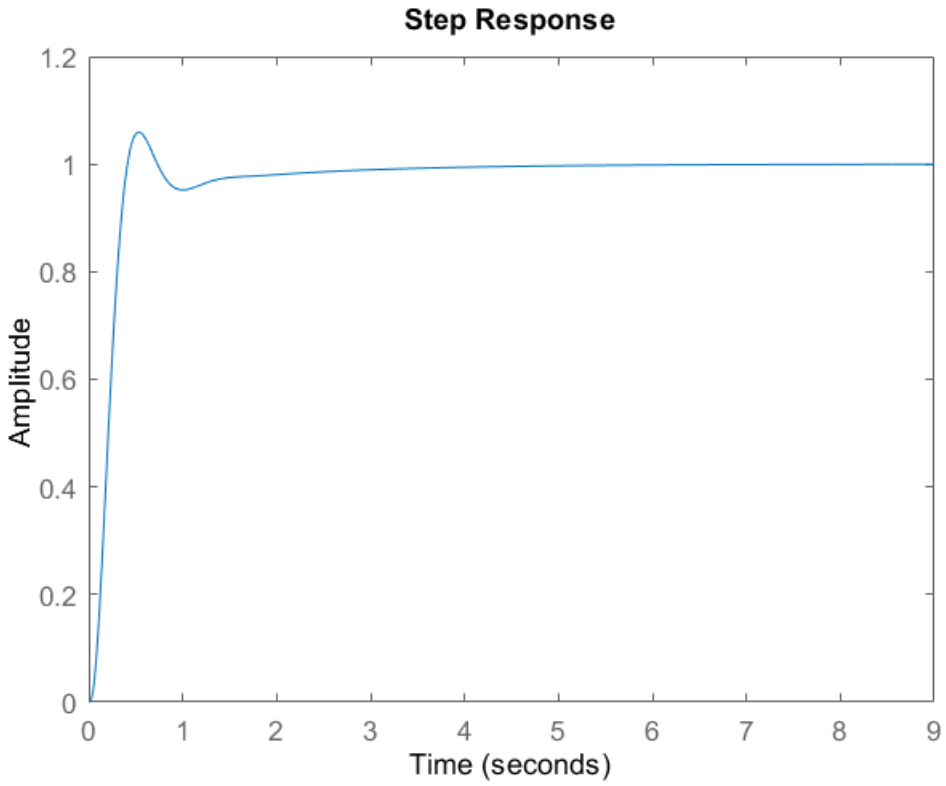
```
mag = 0.9997
phase = -120.0300
wout = 5
sdmag =

     []


sdphase =

     []
```

```
margin(L)
```



Step response of the closed loop system.

```
step(L/(L+1))
```


Step Response
Amplitude
Time (seconds)
0
0.2
0.4
0.6
0.8
1
1.2
0
1
2
3
4
5
6
7
8
9