

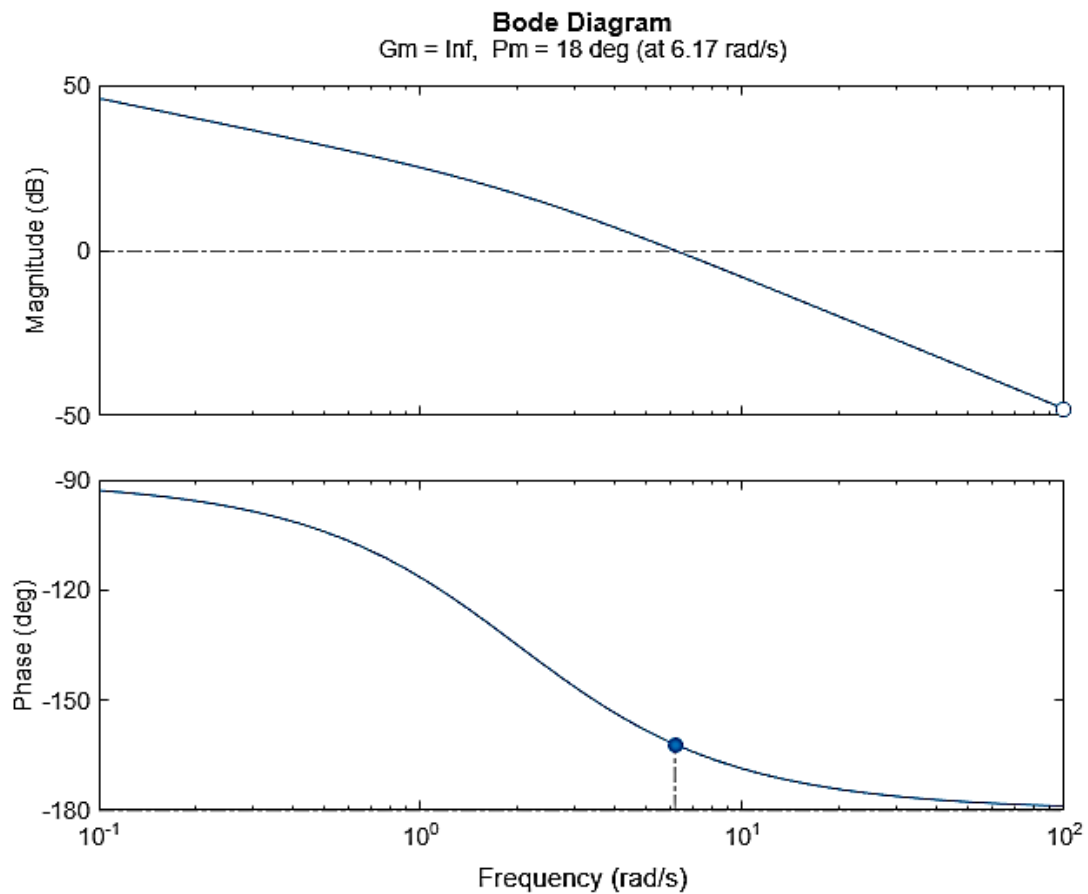
1. Without compensator, $G(s) = 40/s(s + 2)$

MATLAB Code:

```
num = [40];  
den = [1 2 0];  
g = tf(num, den); bode(g)  
grid on  
[Gm,pm,wcp,wgc]=margin(g);  
margin(g)
```

Output:

Gain Margin (GM): Inf dB
Phase Margin (PM): 17.96 degrees
Gain Crossover Frequency (wgc): 6.16 rad/s
Phase Crossover Frequency (wcp): Inf rad/s



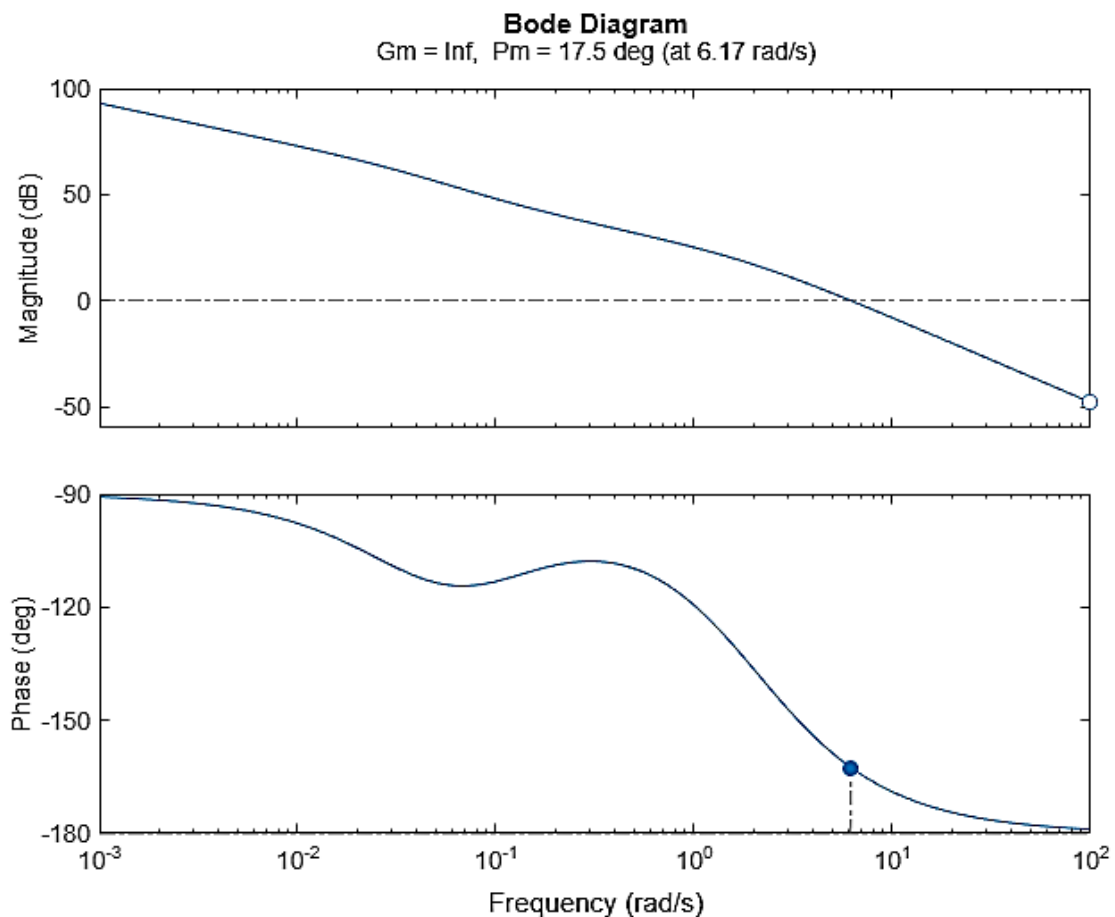
2. With lag compensator, $G(s) = 40(s + 0.092)/s(s + 2)(s + 0.041)$

MATLAB Code:

```
num = [40 3.68];  
den = [1 2.041 0.082 0];  
g = tf(num, den); bode(g)  
grid on  
[Gm,pm,wcp,wgc]=margin(g);  
margin(g)
```

Output:

Gain Margin (GM): Inf dB
Phase Margin (PM): 17.49 degrees
Gain Crossover Frequency (wgc): 6.18 rad/s
Phase Crossover Frequency (wcp): Inf rad/s



3. Lag compensator, $G(s) = (s + 0.092)/(s + 0.041)$

MATLAB Code:

```
num = [1 0.092];  
den = [1 0.041];  
g = tf(num, den); bode(g)  
grid on  
[Gm,pm,wcp,wgc]=margin(g);  
margin(g)
```

Output:

Gain Margin (GM): Inf dB
Phase Margin (PM): -180 degrees
Gain Crossover Frequency (wgc): Inf rad/s
Phase Crossover Frequency (wcp): Inf rad/s

