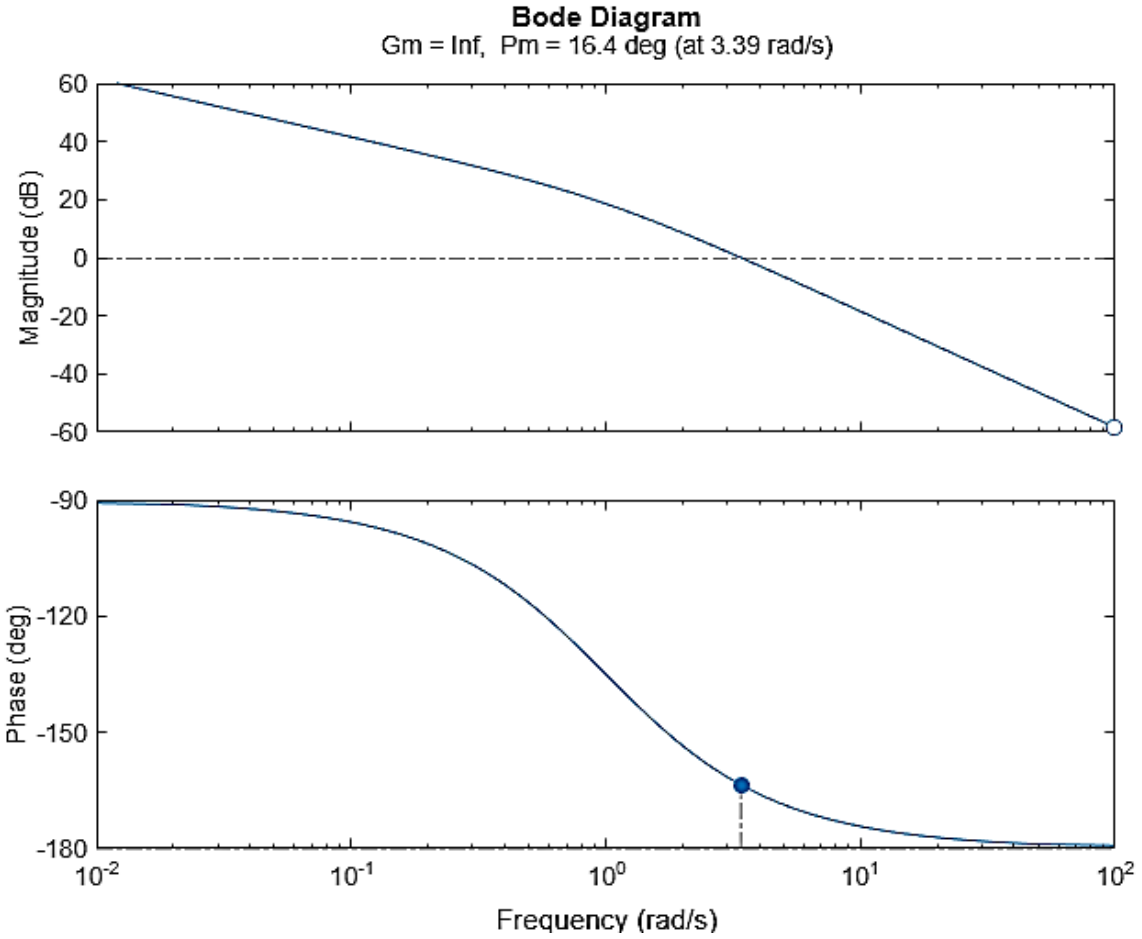
1. Without compensator, G(s) = $12/s(s+1)$

MATLAB Code:

```
num = [12];
den = [1 1 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): 16.4 degrees
Gain Crossover Frequency (wcg): 3.39 rad/s
Phase Crossover Frequency (wpc): Inf rad/s
```



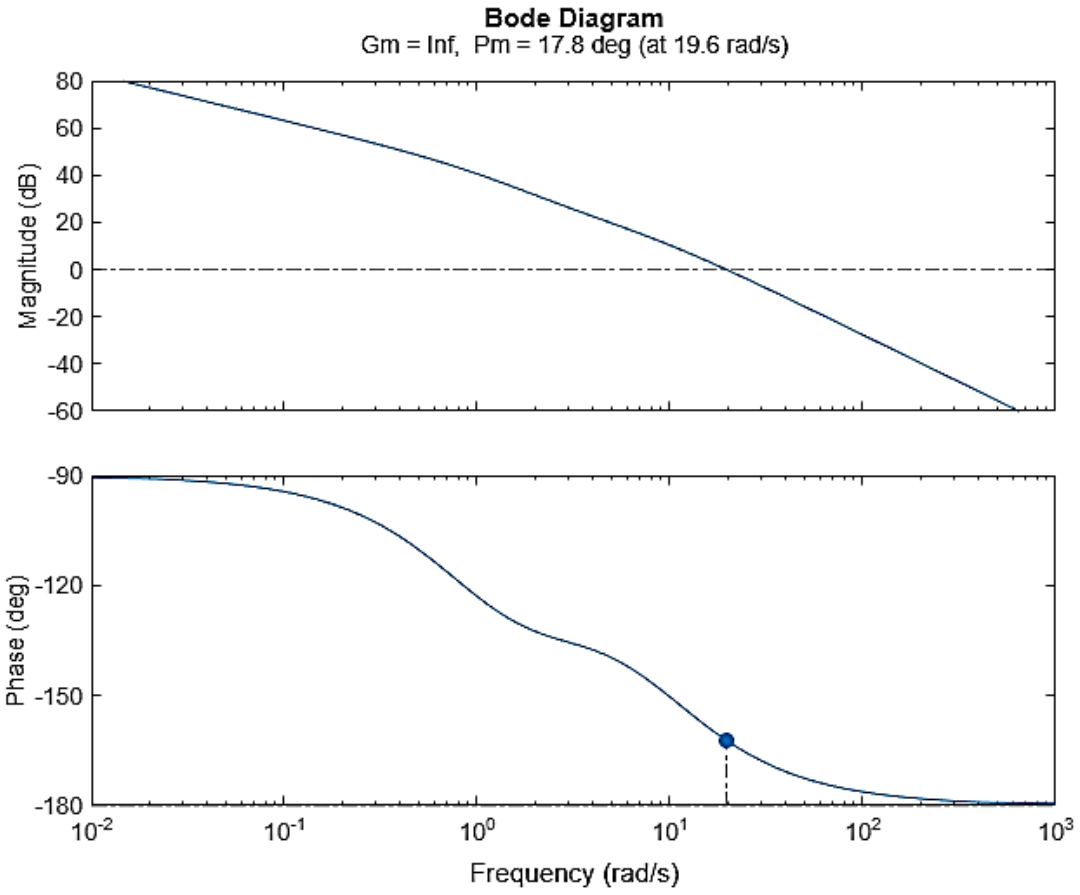
2. With lead compensator, G(s) =$144(0.339s + 1)/s(s + 1)(1 + 0.1178s)$

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): 17.8 degrees
Gain Crossover Frequency (wcg): 19.6 rad/s
Phase Crossover Frequency (wpc): Inf rad/s
```



3. Lead compensator, G(s) =$12(0.339s + 1)/(0.1178s + 1)$

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): Inf degrees
Gain Crossover Frequency (wcg): -
Phase Crossover Frequency (wpc): -
```