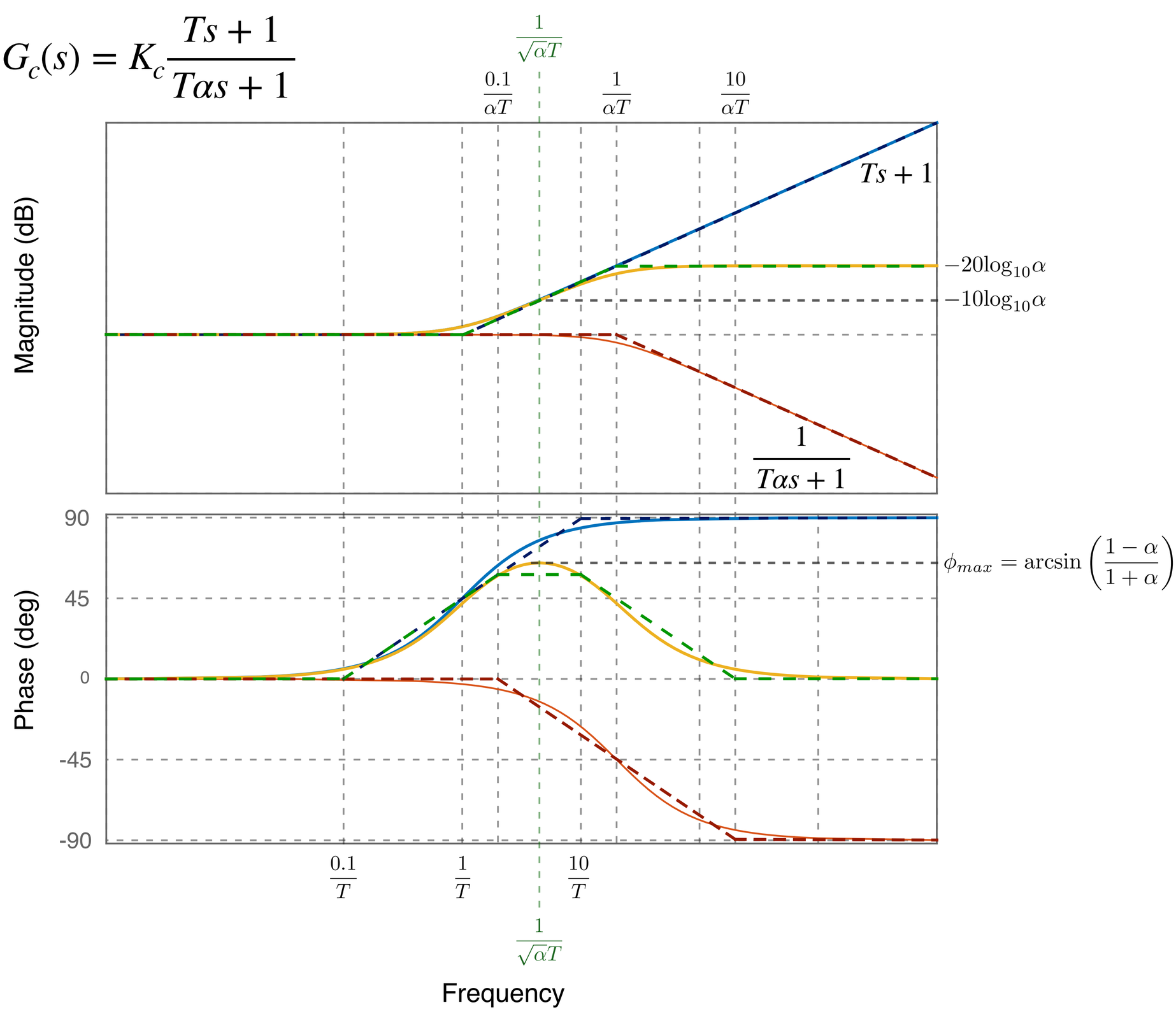
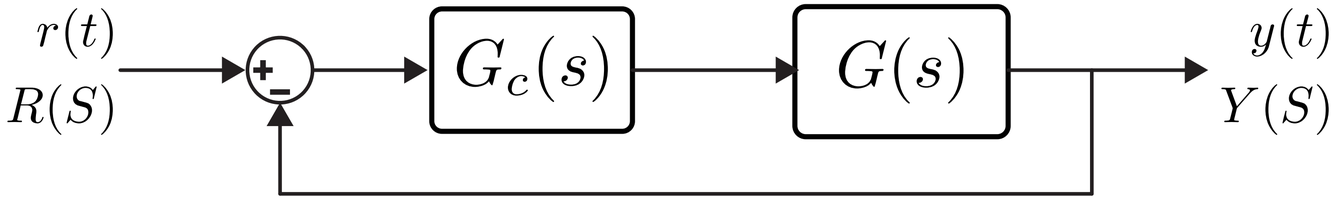
Phase-Lead Compensator

$$G_c(s) = K_c \frac{Ts + 1}{T\alpha s + 1} \qquad \alpha \in (0,1)$$

$$G_c(s) = K_c \frac{Ts+1}{T\alpha s+1}$$



$$\phi_{max} = \arcsin\left(\frac{1-\alpha}{1+\alpha}\right)$$

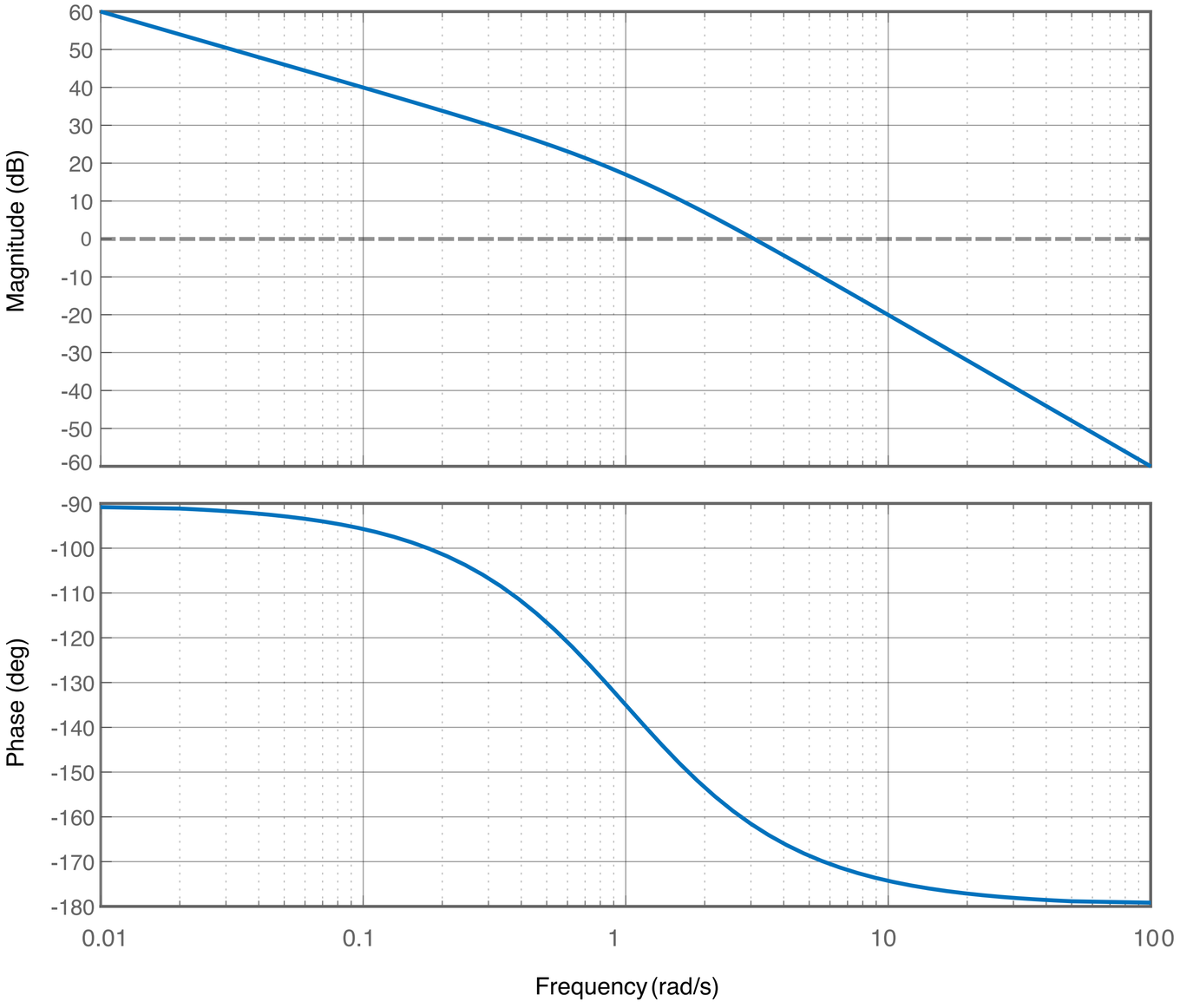


Steady-state performance is already satisfactory

Design a lead-compensator such that

$$\phi_M^* = [45^0 \ , \ 55^0]$$

$$G(s)$$



$$G_c(s) = \frac{Ts+1}{T\alpha s+1} \quad \alpha \in (0,1)$$

Magnitude (dB)

60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60

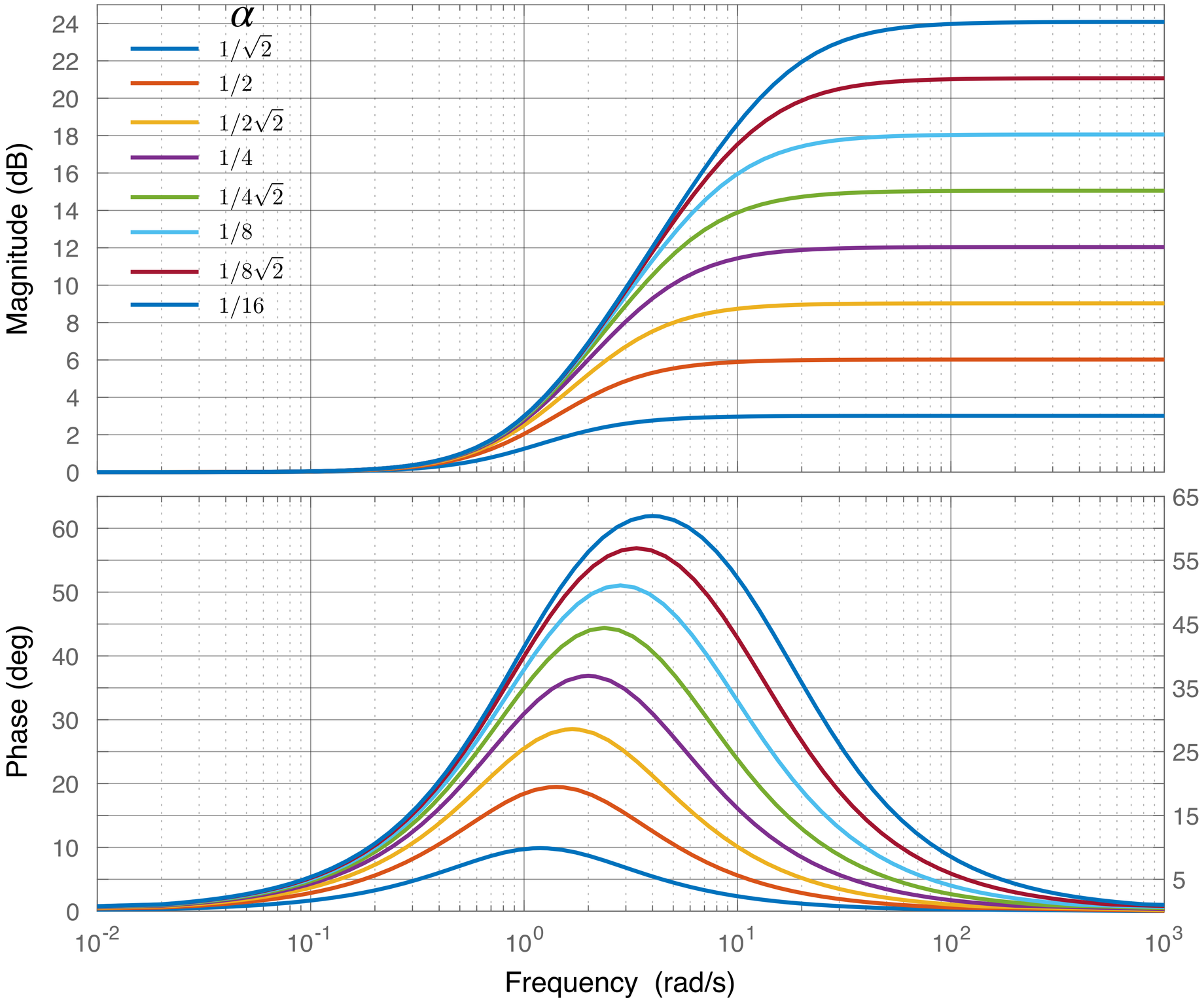
Phase (deg)

-90
-100
-110
-120
-130
-140
-150
-160
-170
-180

0.01
0.1
1
10
100

Frequency (rad/s)

$$G_c(s) = \frac{s+1}{\alpha s+1}$$



Magnitude (dB)

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Phase (deg)

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Magnitude (dB)

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Frequency (rad/s)

Magnitude (dB)

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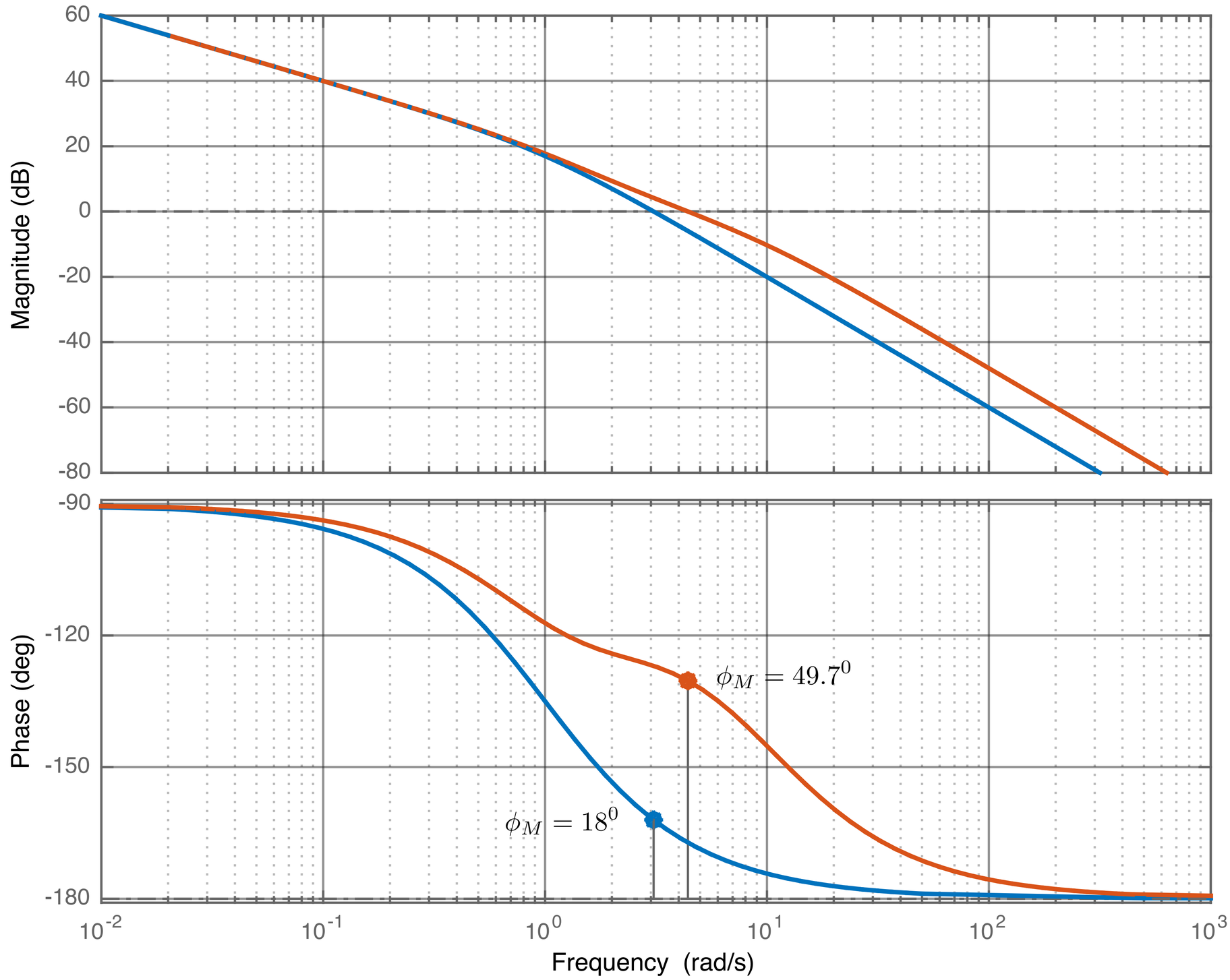
-140
-150
-160
-170
-180

0.01
0.1
1
10
100

Frequency (rad/s)

Uncompansated vs Compensated Bode Plots



Uncompansated vs Compensated Step Responses