

Modelling and control summaries



by Anthony Rossiter

Margins 5: Tutorial sheet

PHASE MARGIN:

1. Find a frequency ω_g such that $|G(j\omega_g)|=1$.
2. Find a clockwise rotation $e^{-j\phi}$ such that $G(j\omega_g) e^{-j\phi}=-1$.
3. Phase margin = $\phi = 180+\arg(G(j\omega_g))$.

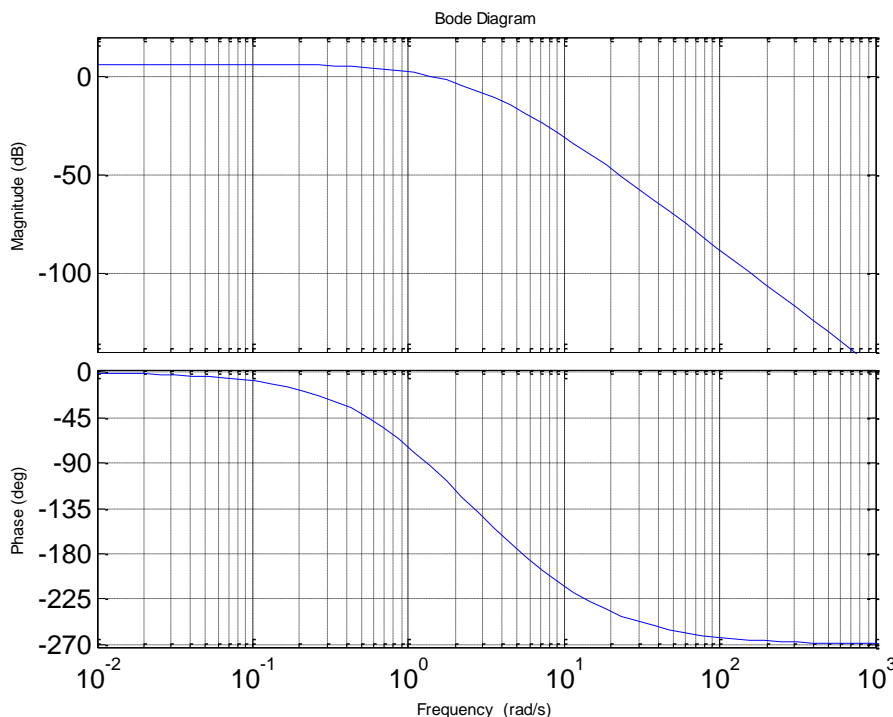
GAIN MARGIN

1. Find ω_p such that $\arg(G(j\omega_p))=-180$.
2. Find a real number K such that $G(j\omega_p)K=-1$.
3. Gain margin = $K = 1/|G(j\omega_p)|$

Using the above definitions use both analysis and Bode diagrams to determine the margins for the examples given. Check your answers with MATLAB.

$$G = \frac{8}{s(s+1)(s+4)}; \quad G = \frac{s+2}{s^2(s+1)}; \quad G = \frac{2-s}{s(s+5)}$$

$$G = \frac{30}{s^2+2s+4}; \quad G = \frac{27}{(s+2)^3}$$



$$\frac{40(s+6)}{(s+10)(s+1)(s+3)(s+4)}$$

