Asymptotic frequency-response plots, Bode Plot.

In the transfer function T(s) put s = jω and depict the curves for $20\cdot\log|T(j\omega)|$, [dB] and $\angle T(j\omega)$, [°] with a logarithmic ω-axis [rad/s]. Or rescaled for a frequency-axis [Hz].

1. T(s) = K Amplitude: horizontal line at 20·logK. Phase: horizontal line at 0 (±180° if negative)

2. T(s) = K/s Amplitude: straight line with slope –20dB/dec., intersecting the ω-axis at ω = K. Phase: horizontal line at -90°

3. T(s) = s/K Mirror image of 2) around the ω-axis.

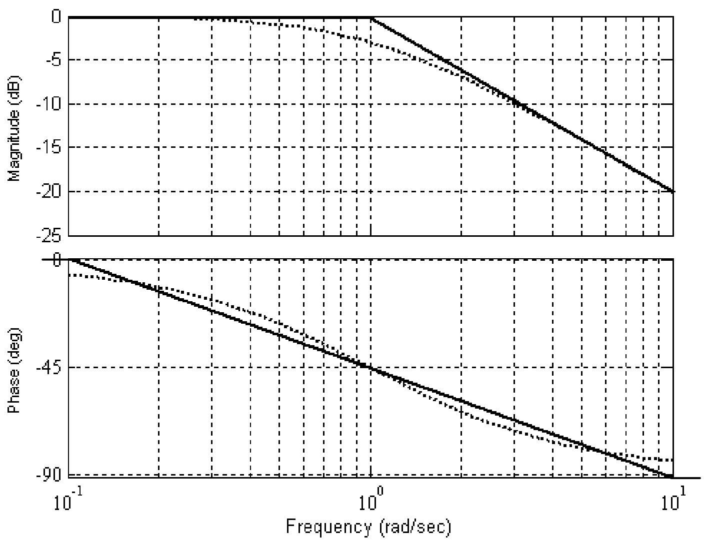
4. $T(s) = \dfrac{\alpha}{s+\alpha} = \dfrac{1}{\frac{1}{\alpha}s+1}$

   Amplitude: horizontal line at 0 dB, breaking to –20 dB/dec. at ω = α, the corner frequency.
   Phase: horizontal line at 0, from 0,1α to 10α declining –45 °/dec. to -90°.
   Goes through –45 ° at ω = α.

5. $T(s) = \dfrac{s+\alpha}{\alpha} = \frac{1}{\alpha}s+1$

   Mirror image of 4) around the ω-axis.

   The ω-axe should be multiplied with α in the fig.



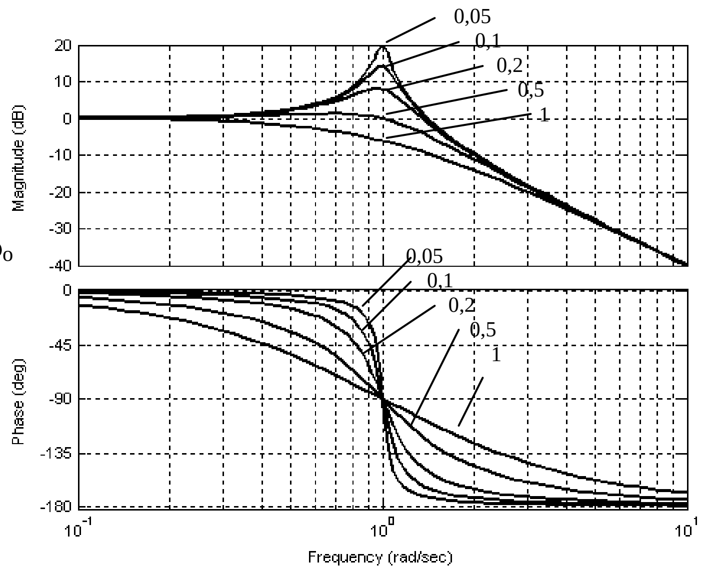
6. $T(s) = \dfrac{\omega_o^2}{s^2+2\varsigma\omega_o s+\omega_o^2} = \dfrac{1}{\frac{1}{\omega_o^2}s^2+\frac{2\varsigma}{\omega_o}s+1}$

   Amplitude: horizontal line at 0 dB, breaking to –40 dB/dec. at $\omega = \omega_o$
   The correction at ω_o is $-20\cdot\log 2\varsigma$.
   Max. gain at $\omega_{max} = \omega_o\,(1-2\varsigma^2)^{½}$.
   Phase: horizontal line at 0, from $0{,}1\omega_o$ to $10\omega_o$ declining –90°/dec. to -180°.
   Goes through –90° at $\omega = \omega_o$.

7. $T(s) = \frac{1}{\omega_o^2}s^2 + \frac{2\varsigma}{\omega_o}s+1$

   Mirror image of 6) around the ω-axis.

   The ω-axis should be multiplied with ω_o in the fig.



Application: T(s) is split into these basic factors. The characteristics for each factor is drawn, and added graphically to get the curve for the complete transfer function. Corrections can be added in certain points if desired.