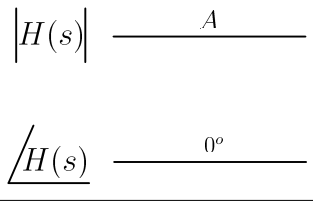
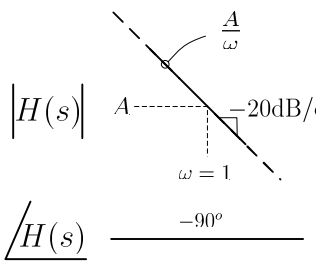

$H(s) = A$

Simple Gain



$H(s) = \frac{A}{s}$

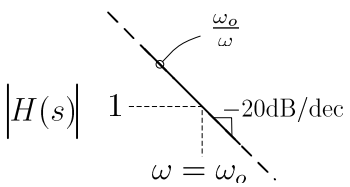
Pole at Zero



Or:

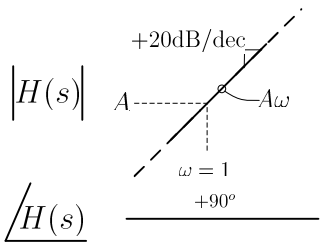
$H(s) = \frac{\omega_o}{s}$

$\omega_o = A$



$H(s) = As$

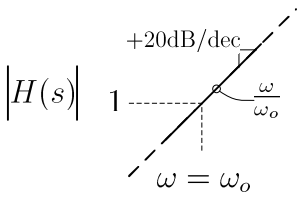
Zero at Zero



Or:

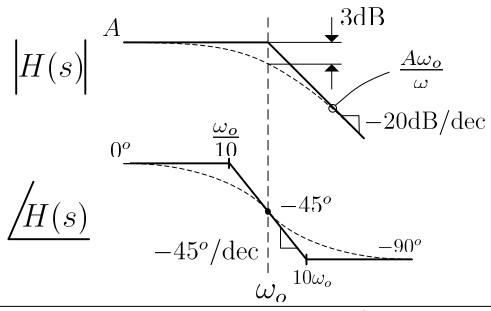
$H(s) = \frac{s}{\omega_o}$

$\omega_o = \frac{1}{A}$



$H(s) = \frac{A}{1+\frac{s}{\omega_o}}$

Pole at ω_o



$\left(\text{If } \omega \gg \omega_o,\ |H(s)| = \frac{A}{(\omega/\omega_o)} = \frac{A\omega_o}{\omega}\right)$

Maximum Error @ $\omega_o = 3$dB

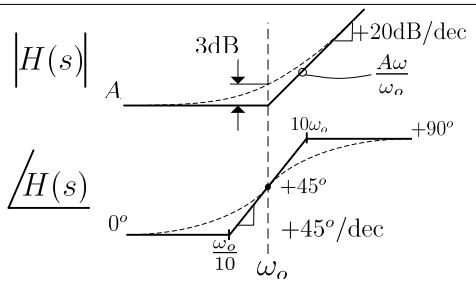
Maximum Error @ $\frac{\omega_o}{10}$ & $10\omega_o = 5.7^o$

Exact Phase: $-tan^{-1}\left(\frac{\omega}{\omega_o}\right), \forall\omega$

Approx. Phase: $-45^o log_{10}\left(\frac{10\omega}{\omega_o}\right)$,
$\frac{\omega_o}{10} \leq \omega \leq 10\omega_o$

$H(s) = A\left(1+\frac{s}{\omega_o}\right)$

Zero at ω_o



Maximum Error @ $\omega_o = 3$dB

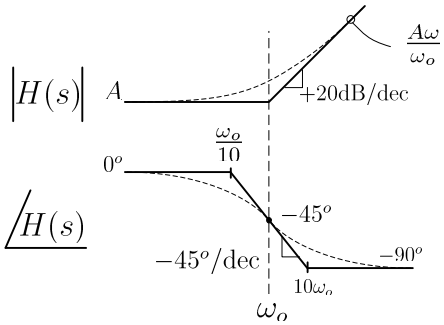
Maximum Error @ $\frac{\omega_o}{10}$ & $10\omega_o = 5.7^o$

Exact Phase: $tan^{-1}\left(\frac{\omega}{\omega_o}\right), \forall\omega$

Approx. Phase: $45^o log_{10}\left(\frac{10\omega}{\omega_o}\right)$,
$\frac{\omega_o}{10} \leq \omega \leq 10\omega_o$

$H(s) = A\left(1-\frac{s}{\omega_o}\right)$

Right Half Plane Zero at ω_o



Maximum Error @ $\omega_o = 3$dB

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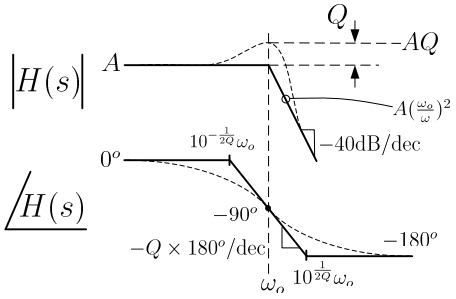
$H(s) = \frac{A}{1+\frac{s}{Q\omega_o}+\left(\frac{s}{w_o}\right)^2}$

Second Order Complex Pole



ω_o=Corner Frequency

$Q > \frac{1}{2} \implies$ Complex Roots

Q=Quality Factor: Exact Gain @ ω_o
Approximate Maximum Value

Exact Phase: $-tan^{-1}\left[\frac{\frac{1}{Q}\frac{\omega}{\omega_o}}{1-(\frac{\omega}{\omega_o})^2}\right], \forall\omega$