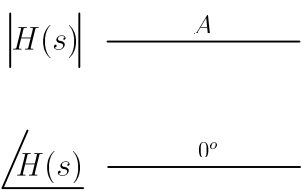
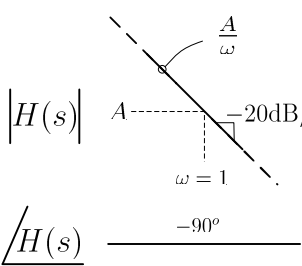
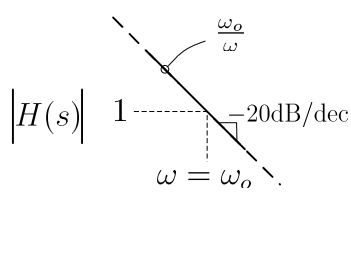
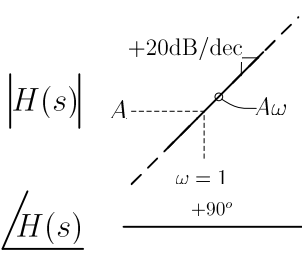
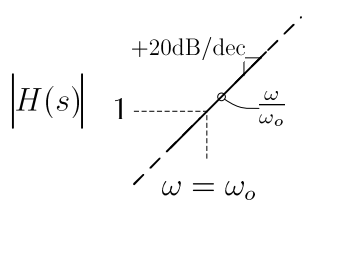
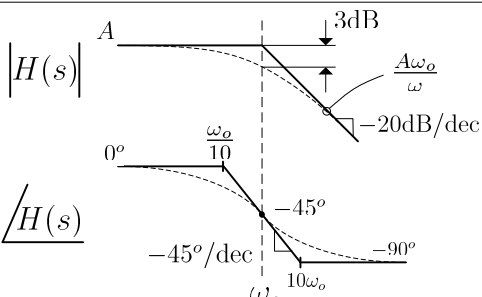
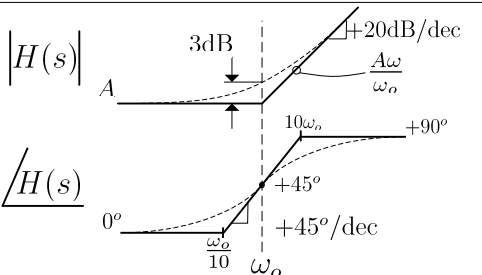
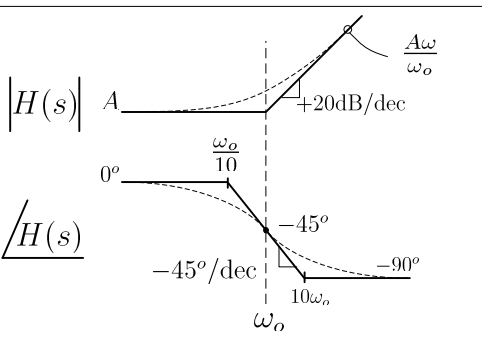
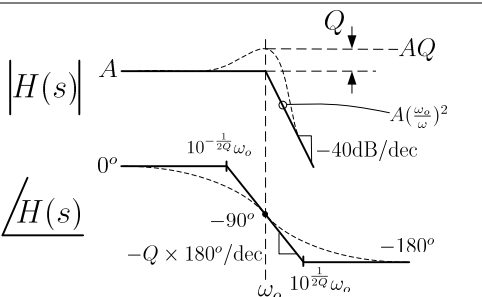


$H(s) = A$  Simple Gain	
$H(s) = \frac{A}{s}$  Pole at Zero	 <p style="text-align: center;">Or:</p> 
$H(s) = As$  Zero at Zero	 <p style="text-align: center;">Or:</p> 
$H(s) = \frac{A}{1 + \frac{s}{\omega_o}}$  Pole at $\omega_o$	 <p style="text-align: right;">                 (If <math>\omega \gg \omega_o</math>, <math> H(s)  = \frac{A}{(\omega/\omega_o)} = \frac{A\omega_o}{\omega}</math>)                  Maximum Error @ <math>\omega_o = 3\text{dB}</math>                  Maximum Error @ <math>\frac{\omega_o}{10}</math> &amp; <math>10\omega_o = 5.7^\circ</math>                  Exact Phase: <math>-\tan^{-1}\left(\frac{\omega}{\omega_o}\right), \forall \omega</math>                  Approx. Phase: <math>-45^\circ \log_{10}\left(\frac{10\omega}{\omega_o}\right), \frac{\omega_o}{10} \leq \omega \leq 10\omega_o</math> </p>
$H(s) = A\left(1 + \frac{s}{\omega_o}\right)$  Zero at $\omega_o$	 <p style="text-align: right;">                 Maximum Error @ <math>\omega_o = 3\text{dB}</math>                  Maximum Error @ <math>\frac{\omega_o}{10}</math> &amp; <math>10\omega_o = 5.7^\circ</math>                  Exact Phase: <math>\tan^{-1}\left(\frac{\omega}{\omega_o}\right), \forall \omega</math>                  Approx. Phase: <math>45^\circ \log_{10}\left(\frac{10\omega}{\omega_o}\right), \frac{\omega_o}{10} \leq \omega \leq 10\omega_o</math> </p>
$H(s) = A\left(1 - \frac{s}{\omega_o}\right)$  Right Half Plane Zero at $\omega_o$	 <p style="text-align: right;">                 Maximum Error @ <math>\omega_o = 3\text{dB}</math>                  Maximum Error @ <math>\frac{\omega_o}{10}</math> &amp; <math>10\omega_o = 5.7^\circ</math>                  Exact Phase: <math>-\tan^{-1}\left(\frac{\omega}{\omega_o}\right), \forall \omega</math>                  Approx. Phase: <math>-45^\circ \log_{10}\left(\frac{10\omega}{\omega_o}\right), \frac{\omega_o}{10} \leq \omega \leq 10\omega_o</math> </p>
$H(s) = \frac{A}{1 + \frac{s}{Q\omega_o} + \left(\frac{s}{\omega_o}\right)^2}$  Second Order Complex Pole	 <p style="text-align: right;"> <math>\omega_o = \text{Corner Frequency}</math>  <math>Q &gt; \frac{1}{2} \implies \text{Complex Roots}</math>  <math>Q = \text{Quality Factor: Exact Gain @ } \omega_o</math>                      Approximate Maximum Value                      Exact Phase: <math>-\tan^{-1}\left[\frac{\frac{1}{Q}\frac{\omega}{\omega_o}}{1 - \left(\frac{\omega}{\omega_o}\right)^2}\right], \forall \omega</math> </p>