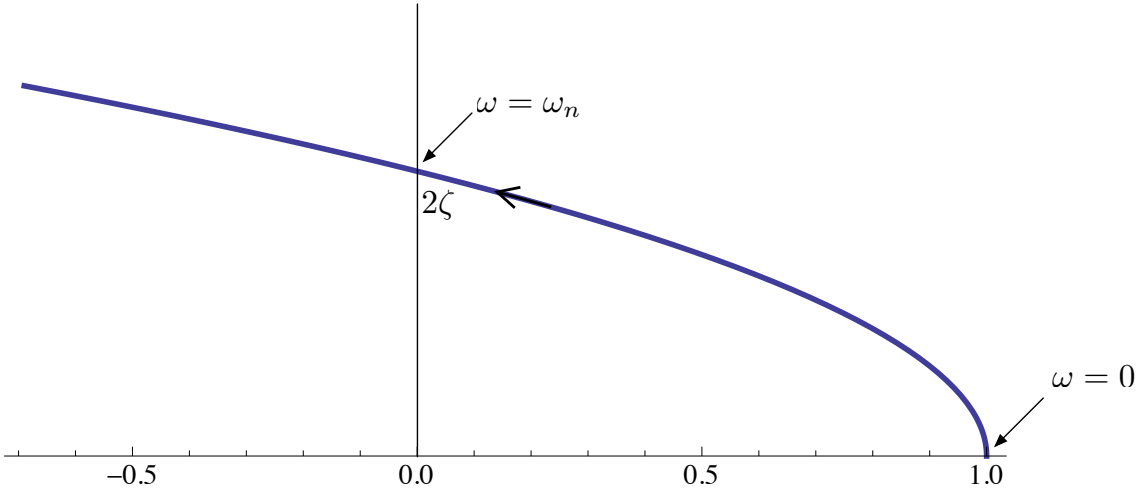
Type 3: $\left(\frac{j\omega}{\omega_n}\right)^2 + 2\zeta\frac{j\omega}{\omega_n} + 1$, Magnitude



Nyquist plot
$(0 < \omega < \infty)$

$$(R(\omega), I(\omega)) = \left(1 - \left(\frac{\omega}{\omega_n}\right)^2, 2\zeta\frac{\omega}{\omega_n}\right)$$

Magnitude:

- for $\omega \ll \omega_n$, $M \approx 1$ (horizontal line)
- for $\omega \gg \omega_n$, $M \approx \left(\frac{\omega}{\omega_n}\right)^2 \Rightarrow \log M \approx 2\log\omega - 2\log\omega_n$
  The asymptote is a line of slope 2 passing through the point $(\omega = \omega_n, M = 1)$

For a stable complex zero, the magnitude slope steps up by 2 as we go through the breakpoint.