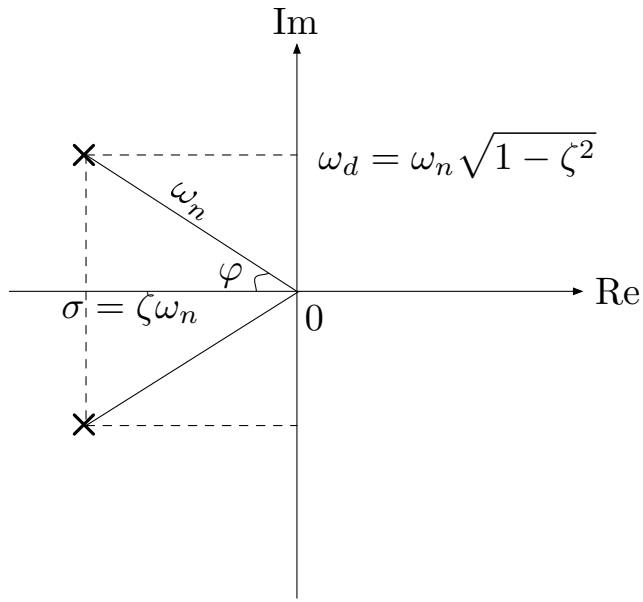
# Transient Response Specs

Now let's consider the more interesting case: *2nd-order response*

$$H(s) = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} = \frac{\omega_n^2}{(s+\sigma)^2 + \omega_d^2}$$

where $\sigma = \zeta\omega_n$ $\omega_d = \omega_n\sqrt{1-\zeta^2}$ $\qquad (\zeta < 1)$




Step response: $\qquad y(t) = 1 - e^{-\sigma t}\left(\cos(\omega_d t) + \frac{\sigma}{\omega_d}\sin(\omega_d t)\right)$