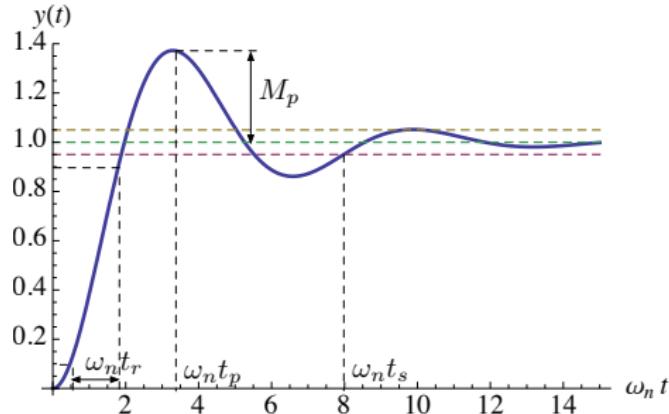


Formulas for TD Specs: Settling Time



$$t_s = \min \left\{ t > 0 : \frac{|y(t') - y(\infty)|}{y(\infty)} \leq 0.05 \text{ for all } t' \geq t \right\} \text{ (here, } y(\infty) = 1)$$

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

here, $e^{-\sigma t}$ is what matters (sin and cos are bounded between ± 1), so $e^{-\sigma t_s} \leq 0.05$ this gives $t_s = -\frac{\ln 0.05}{\sigma} \approx \frac{3}{\sigma}$