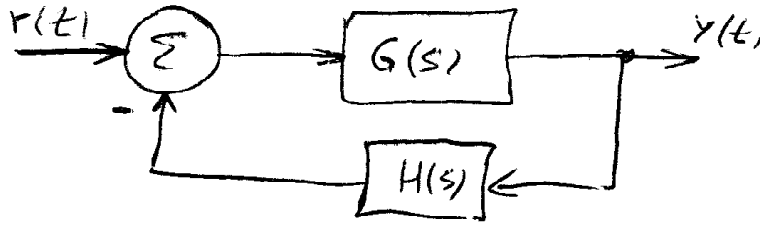


1. Consider the closed-loop system shown below:



$$\frac{Y(s)}{R(s)} = \frac{G(s)}{1 + G(s)H(s)}$$

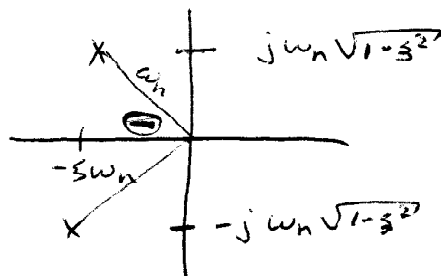
2. For a first-order system $b/(s + a)$ whose input is a height- R step, the output is given by

$$\frac{Rb}{a}(1 - e^{-at})$$

3. For a stable system, the (approximate) settling time of a control system is given by $4.62/\alpha$, where α is the negative of the real part of the pole(s) closest to the $j\omega$ axis.
4. The transfer function of a standard 2nd-order system is:

$$\frac{b}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

5. For $\zeta < 1$ the poles of a standard 2nd-order system are shown below



6. For $\zeta > 1$ the poles of a standard 2nd-order system are at $-\zeta\omega_n \pm \omega_n\sqrt{\zeta^2 - 1}$.
7. For $\zeta < 1$ the percent overshoot of a standard 2nd-order system is

$$\text{P.O.} = 100e^{-\zeta\pi/\sqrt{1-\zeta^2}}$$