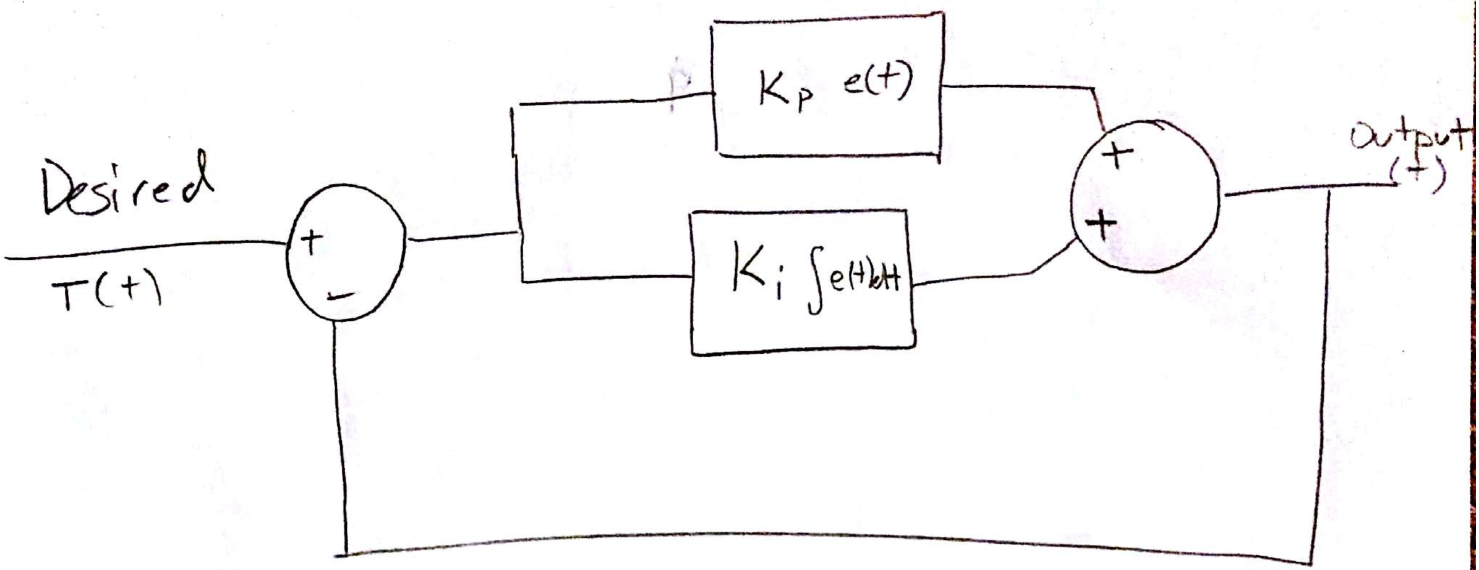

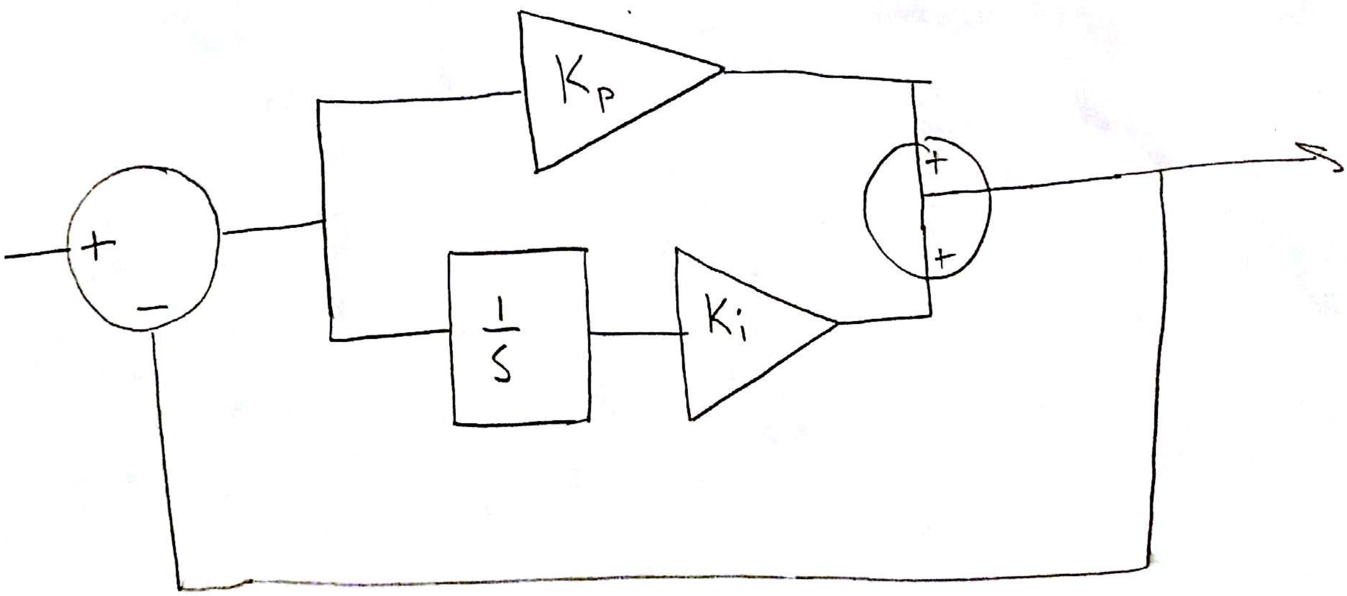

$$H(s) = \frac{(K_i + sK_p)G(s)}{s + (K_i + sK_p)G(s)}$$

$$\sum F = m\ddot{x} = -c\dot{x} - kx$$

$$m\ddot{x} + c\dot{x} + kx = 0$$

$$m\ddot{x}(t) + c\dot{x}(t) + k\,x(t) = F(t)$$

$$ms^2X(s) + cs\,X(s) + k\,X(s) = F(s)$$

$$\frac{X(s)}{F(s)} = \frac{1}{ms^2+cs+k}$$

When no damping $c = 0$

$$ms^2 + k = 0$$

$$ms^2 = -k$$

$$s^2 = \frac{-k}{m}$$

Natural frequency

$$s = \sqrt{\frac{-k}{m}}$$

$$H(s)\, u(s) = \frac{(K_i + sK_p)\, G(s)}{s + (K_i + sK_p)\, G(s)} \quad \frac{1}{s}$$

$$= \frac{(K_i + sK_p)\, G(s)}{s^2 + (K_i + sK_p)\, G(s)\, s}$$

$$s + (K_i + sK_p)\, G(s) = 0$$

$$K_i + sK_p = \frac{-s}{G(s)}$$

$$K_i = \frac{-s}{G(s)} - sK_p$$

$$K_i = \frac{-s(1 - K_p)}{G(s)}$$

~~SFt~~

poles = 0 , I think

Both real

same location!