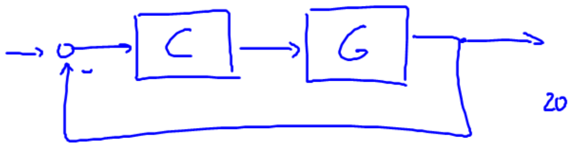
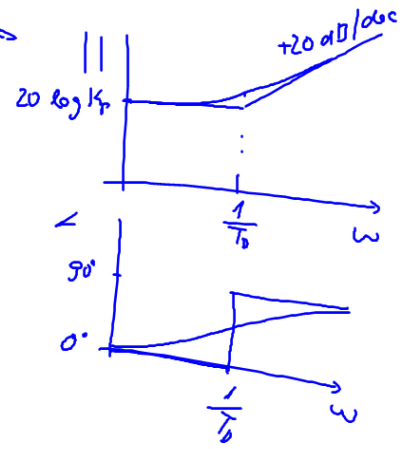




PD. $C(s) = K_p(1 + T_D s)$

$C(j\omega) = K_p(1 + T_D j\omega)$

$s = -\frac{1}{T_D}$, $\omega = \frac{1}{T_D}$

$$C(s) = K_p\left(1 + \frac{1}{T_i s}\right)$$

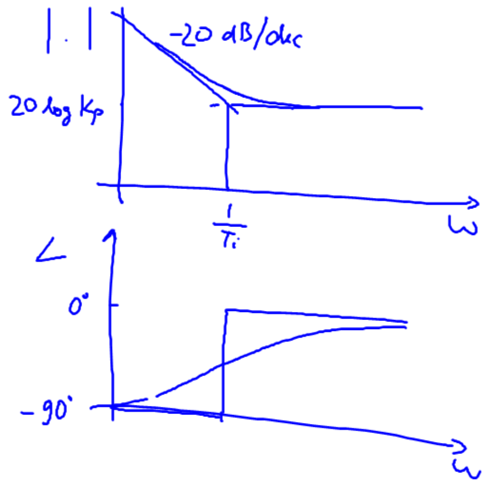
$$= K_p \frac{T_i s + 1}{T_i s}$$

pool: $s = 0$

nul: $s = -\frac{1}{T_i}$

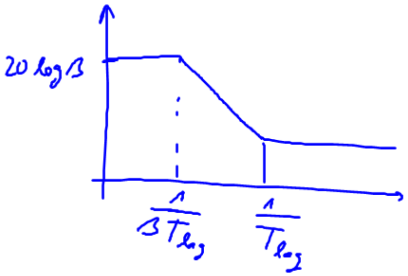
$$= K_p \frac{T_i j\omega + 1}{T_i j\omega}$$

$$E(s) = \frac{1}{1 + G(s) \cdot C(s)} \cdot R(s)$$



$$C_{Lead} = \frac{T_{lead}\, s + 1}{\alpha\, T_{lead}\, s + 1}$$

$$C_{lag} = \beta \frac{T_{lag}\, s + 1}{\beta\, T_{lag}\, s + 1}$$



$$e_{ss} = \lim_{s \to 0} s \cdot \frac{1}{1 + L(s)} \cdot R(s)$$

$$= \lim_{s \to 0} \cancel{s} \frac{1}{1 + L(s)} \cdot \frac{1}{s^{\cancel{2}}}$$

$$= \ldots \frac{1}{s(1 + L(s))} = \frac{1}{s + sL(s)}$$

def. ω_c

$$|G(j\omega_c) \cdot C_{lead}(j\omega_c) \cdot K| = 1 \Rightarrow K = \frac{1}{|G|\,|C_{lead}|}$$

$$G(s) = \frac{1}{s^2}$$

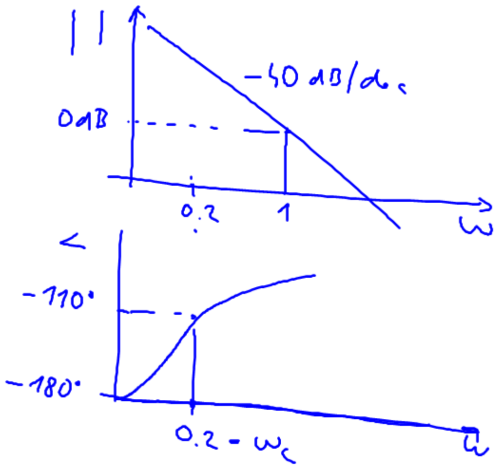
$$G(j\omega) = \frac{1}{(j\omega)^2}$$

$$C = K_p \underbrace{(1 + T_D j\omega)}_{C_d}$$

$$\angle C_d(j\omega_c) = \tan^{-1} \frac{T_d \omega_c}{1}$$

$$70^\circ = \tan^{-1}(T_d \cdot \omega_c)$$

$$\boxed{T_D = \frac{\tan 70^\circ}{\omega_c}} = \underline{13.74}$$



$$K_p = \frac{1}{|G(j\omega_c)|\,|C_d(j\omega_c)|}$$

$$K_p = \frac{1}{|G(j\omega_c)| \cdot |C_d(j\omega_c)|}$$

$$|G(j \cdot 0.2)| = \frac{1}{(j \cdot 0.2)^2} = \frac{1}{0.04}$$

$$= 25$$

$$|C_d(j \cdot 0.2)| = |1 + 13.7 j \cdot 0.2|$$

$$= \sqrt{1^2 + (0.2 \times 13.7)^2}$$

$$= 2.92$$

ω_c - definitie

$$\underbrace{|G(j\omega_c) \cdot C(j\omega_c)|}_{L(j\omega_c)} = 1$$

$$|G(j\omega_c) \cdot K_p C_d(j\omega_c)| = 1$$