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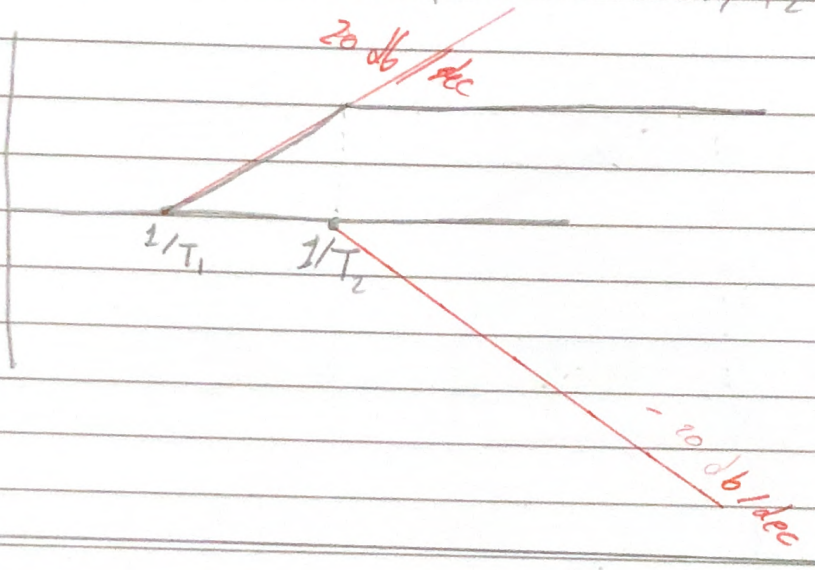
Sheet 6

① @ $G(s) = \frac{1 + T_1 s}{1 + T_2 s}$ $T_1 > T_2$

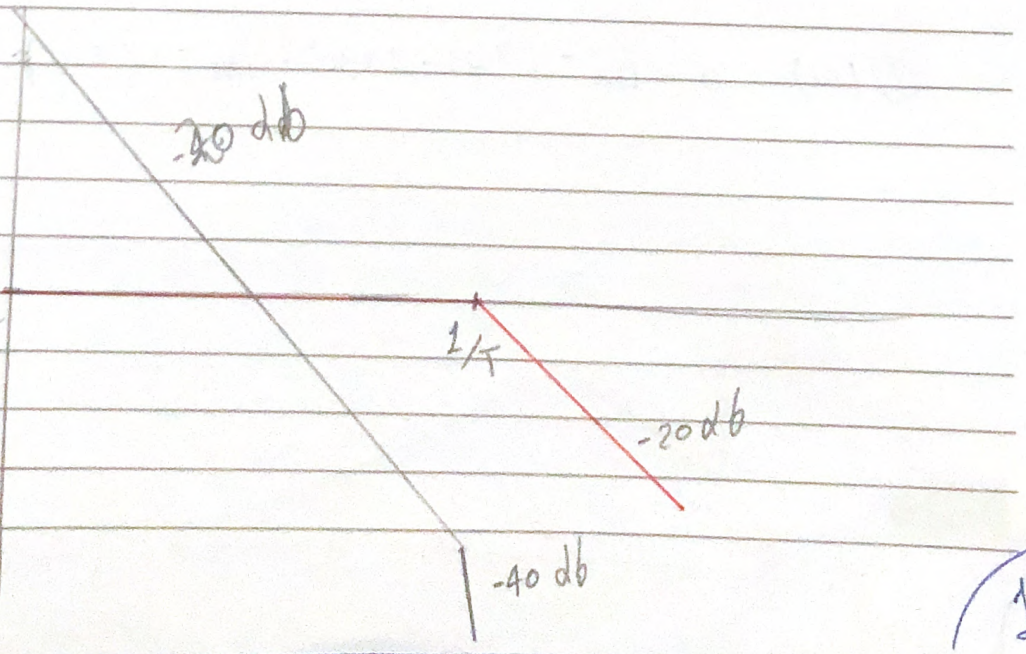
• Corner Frequecies : Zero : $w = \frac{1}{T_1}$

Poles: $w = 1/T_2$



b) $G(s) = \frac{K}{s(1+Ts)}$

Corner : Pole = $w = 1/T$

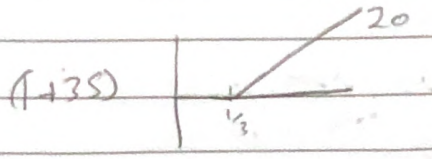


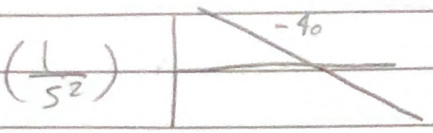
NOTES.

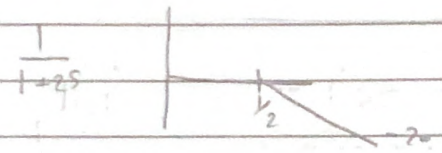
(2) a) $G(s) = \frac{K(1+3s)}{s^2(1+2s)}$

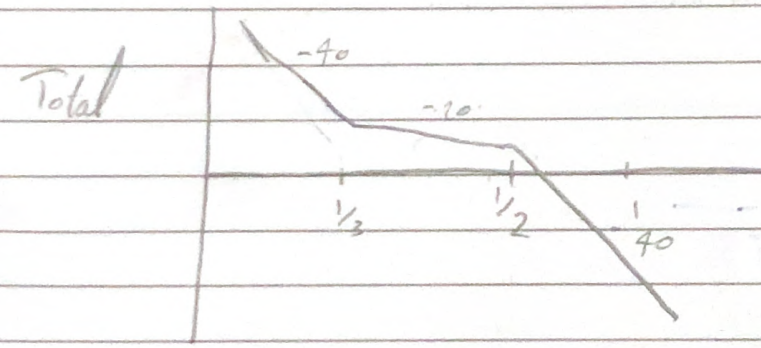
Corner: Zero = $1/3$

Pole = $1/2$



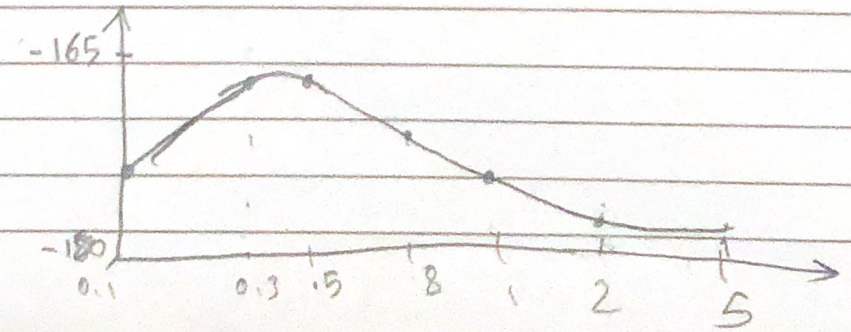




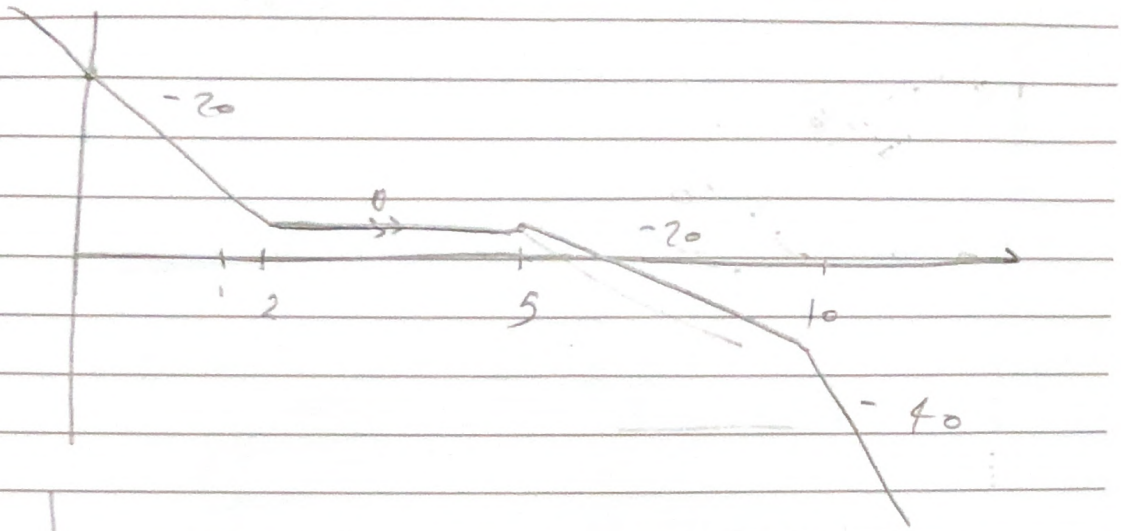


$\phi(w) = 0 + \tan^{-1}(3w) - 2\times 90° - \tan^{-1}(2w)$

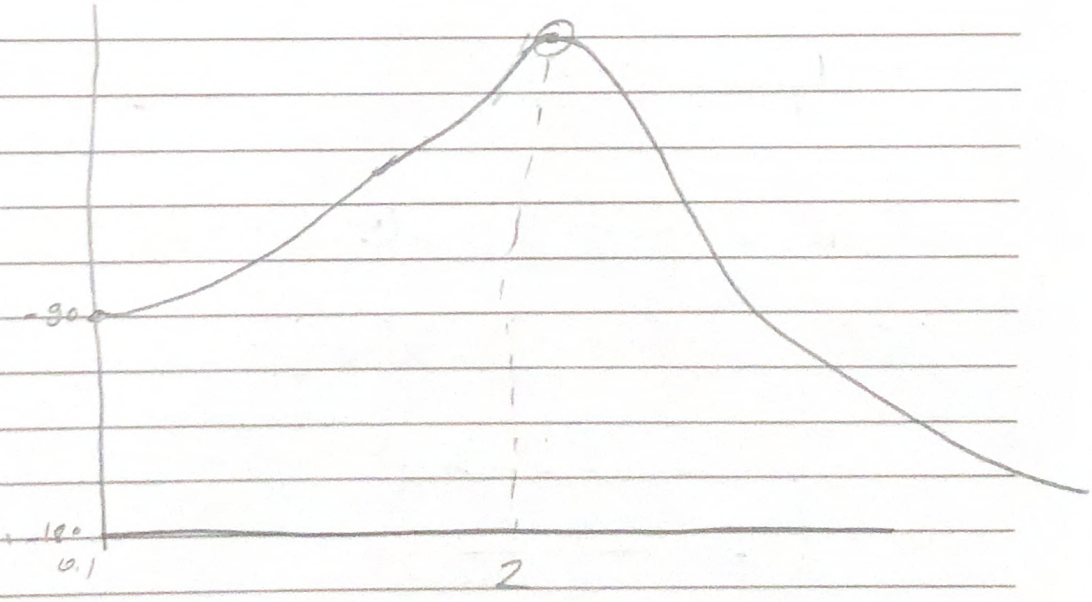
w	0.1	0.3	0.5	0.8	1	2	5
$\phi(w)$	-174.6	-168.97	-168.7	-170.6	-171.9	-175.4	-178.1



b] $G(s) = \dfrac{10(1+0.5s)}{s(1+0.1s)(1+0.2s)}$



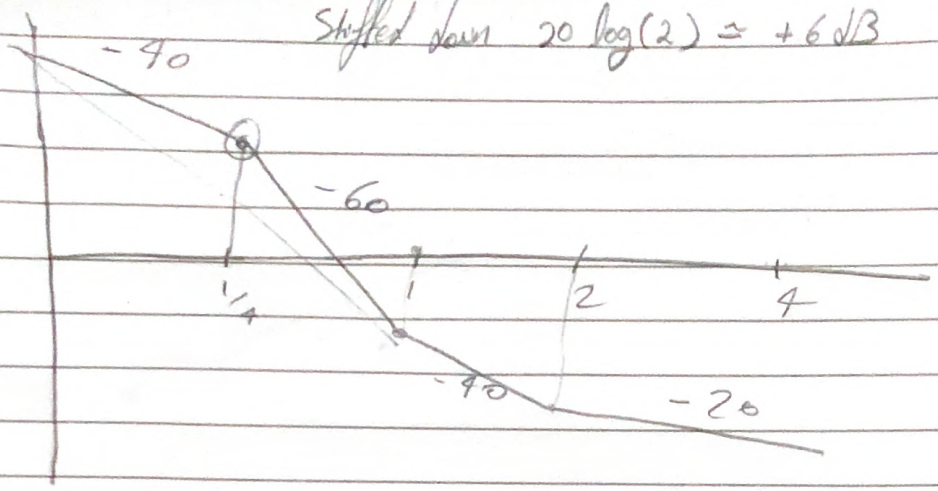
w	0.1	0.2	0.3	0.5	0.8	1	2	3	10
$\phi(w)$	-89	-87	-86	-84	-81.8	-80.4	-78.11	-81.3	-119.7



NOTES.

(3) $G(s) = \frac{2(1+s)(1+0.5s)}{s^2(1+4s)(1+0.25s)}$

a)



b) What is the total correction from the asymptotes at $w=2$?

$$y = 20\log 2 + 20\log\sqrt{1+w^2} + 20\log\sqrt{1+0.25w^2} - 40\log w - 20\log\sqrt{1+16w^2} - 20\log\sqrt{1+\tfrac{1}{8}w^2}$$

at $w=2 \longrightarrow y = -15.9106460\ell$

total Correction $= |y-x| = |y-2|$

$= 17.91$

NOTES

(4) a) from 2 to 20 ⟶ 1 decade

for 1 decade y: 20 ⟶ -20 dB

slope = -40 dB/decade

$$G(s) = \frac{K}{(1+\frac{1}{2}s)^2(1+\frac{1}{20}s)}$$

$20 \log K = 20 \rightarrow$ for $\omega < 2$

$$\boxed{K = 10}$$

$$\lim_{s\to 0} \frac{10}{(1+\frac{1}{2}s)^2(1+\frac{1}{20}s)} = 10$$

b) $$G(s) = \frac{K(1+\frac{1}{0.12}s)}{s^2(1+Ts)}$$

at $\omega = 0.12 \longrightarrow Lm[G(s)] = 20$

$$20 = 20 \log K - 40 \log 0.12$$

$$\boxed{K = 0.144}$$

$$\lim_{s\to 0} s^2 G(s)$$

NOTES.

5 a) $G(s) = \dfrac{K(1+\frac{1}{15}s)(1+\frac{1}{1000}s)}{(1+\frac{1}{4}s)^2(1+\frac{1}{100}s)(1+\frac{1}{500}s)}$

at $\omega \leq 4 \longrightarrow Lm = 40$

$Lm = 20 \log K$

$40 = 20 \log K$

$\boxed{K = 100}$

b) $G(s) = \dfrac{K(1+\frac{1}{5}s)(1+\frac{1}{40}s)}{s^3(1+\frac{1}{200}s)(1+\frac{1}{1000}s)}$

at $\omega = 1 \longrightarrow lm = -60$

$lm = 20 \log K - 60 \log \omega$

$-60 = 20 \log K - 60 \log(1)$

$\log K = -3$

$\boxed{K = \dfrac{1}{1000}}$