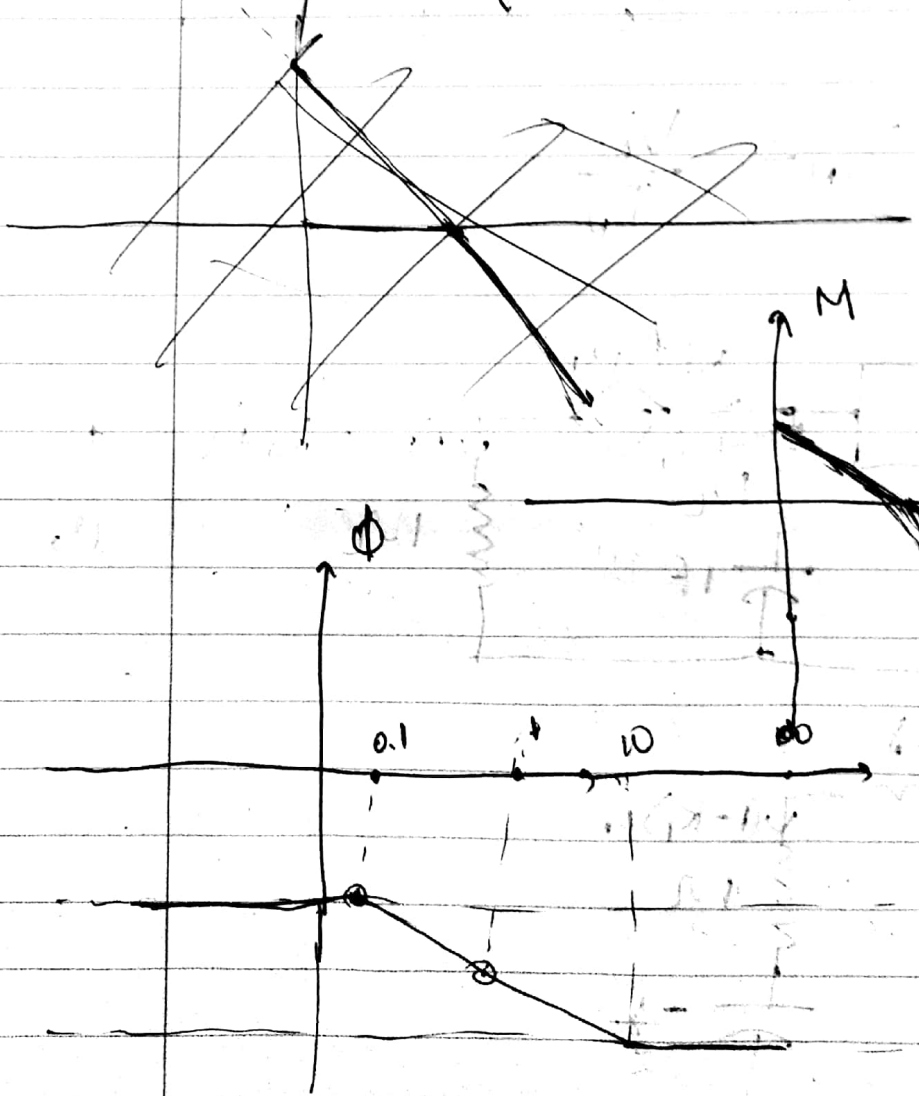
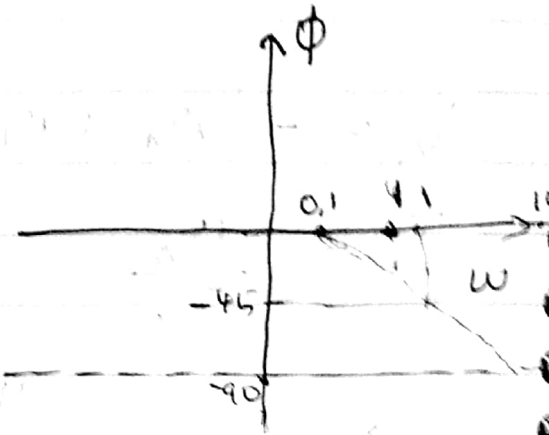
Bode - Plots

① a. $G(s) = \frac{1}{s(s+1)}$

$G(j\omega+1) = \frac{1}{(j\omega+1) * j\omega}$

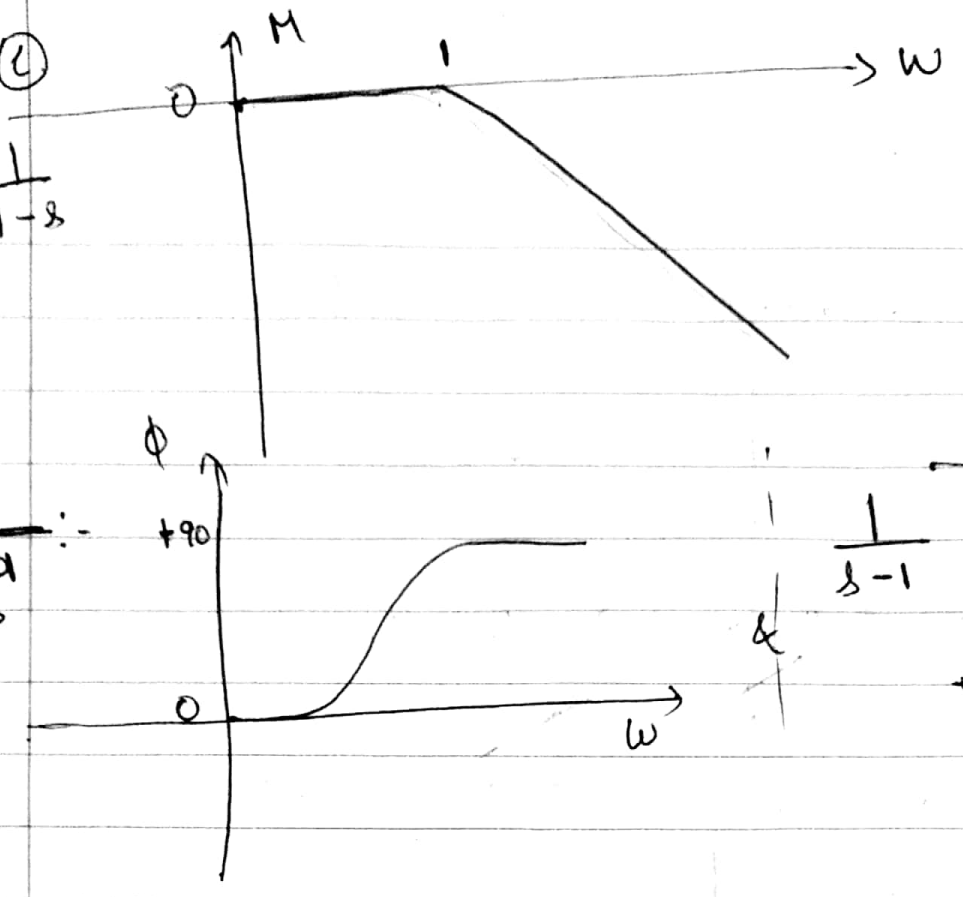
b. $|G| = -\ln(\omega^2+1) . - \ln(\omega^2)$

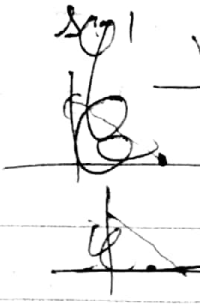




(b) & (c)

$\frac{1}{s-1}$ & $\frac{1}{1-s}$

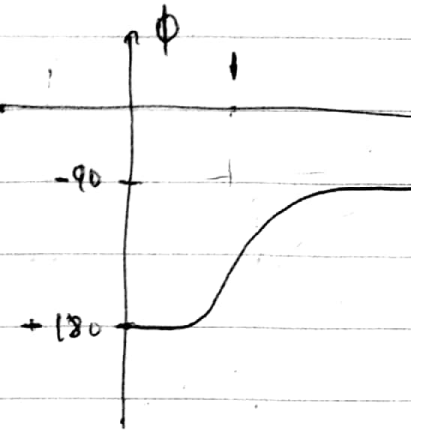




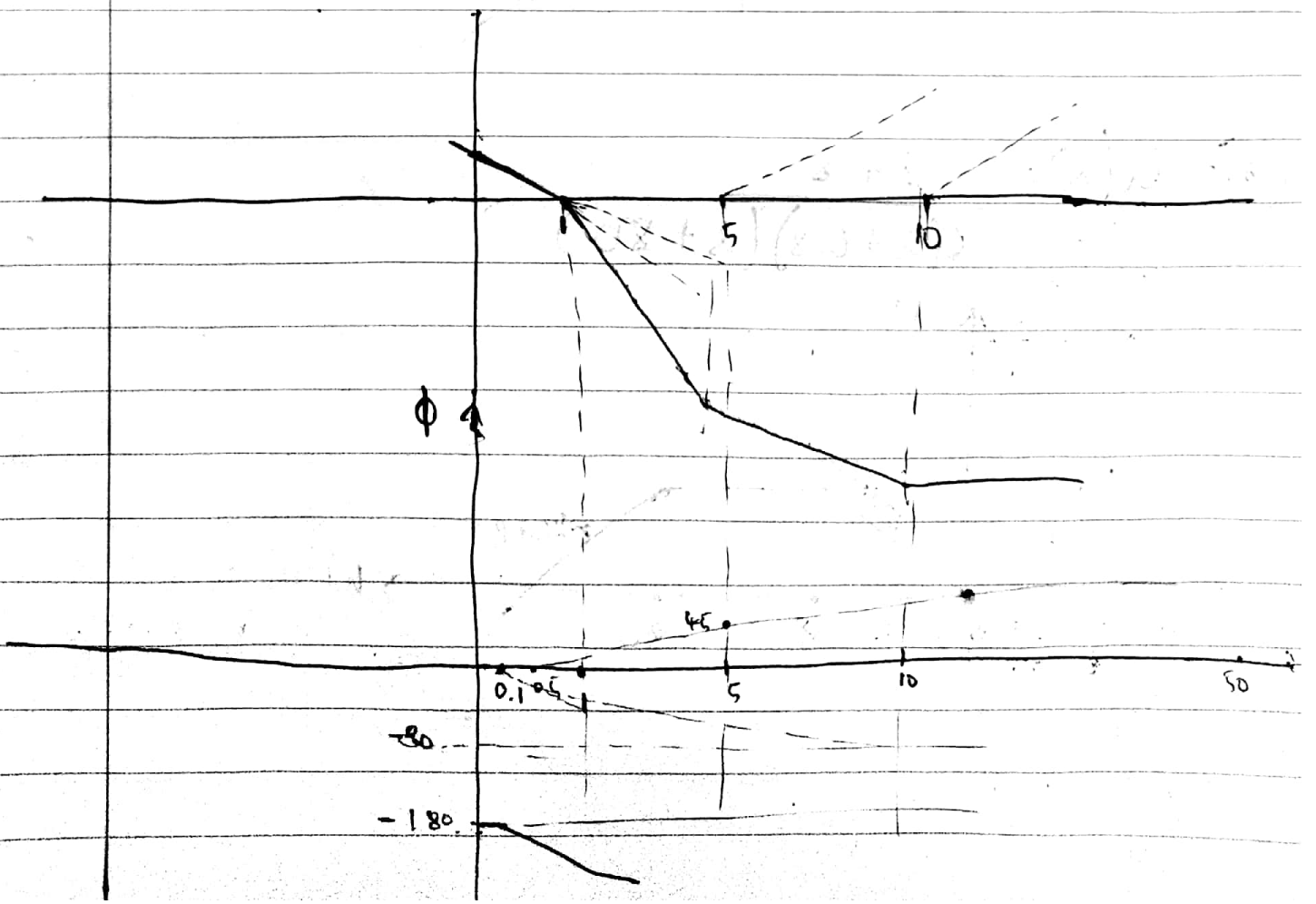
$\frac{1}{1-s}$:-

&

$\frac{1}{s-1}$



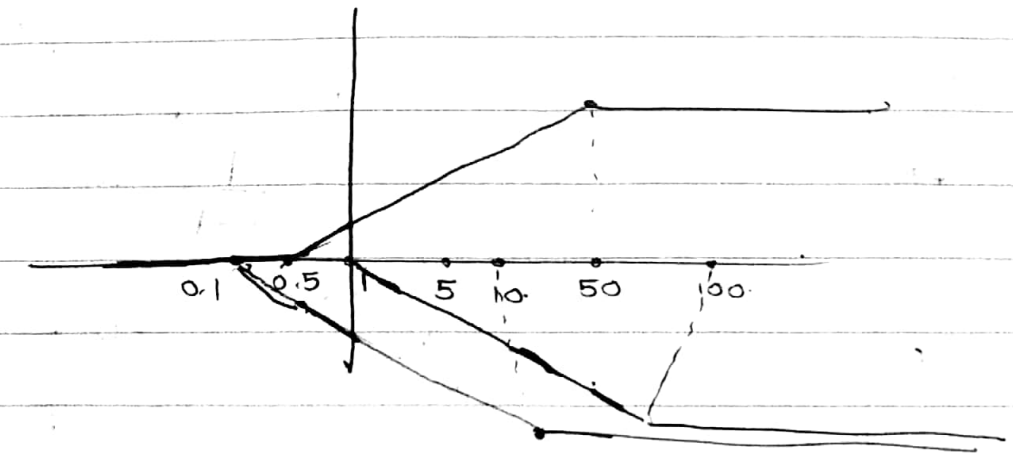
d. $G = \frac{s+5}{s^2(s+1)(s+10)}$

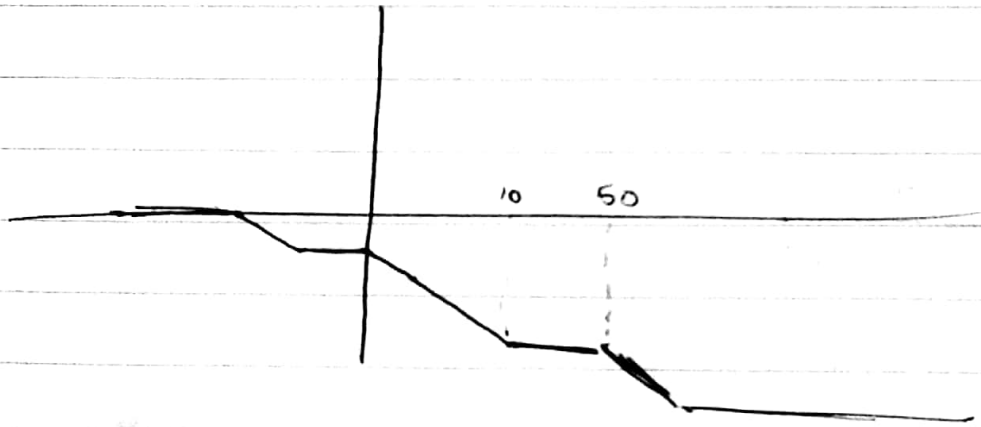


0.1 → 24

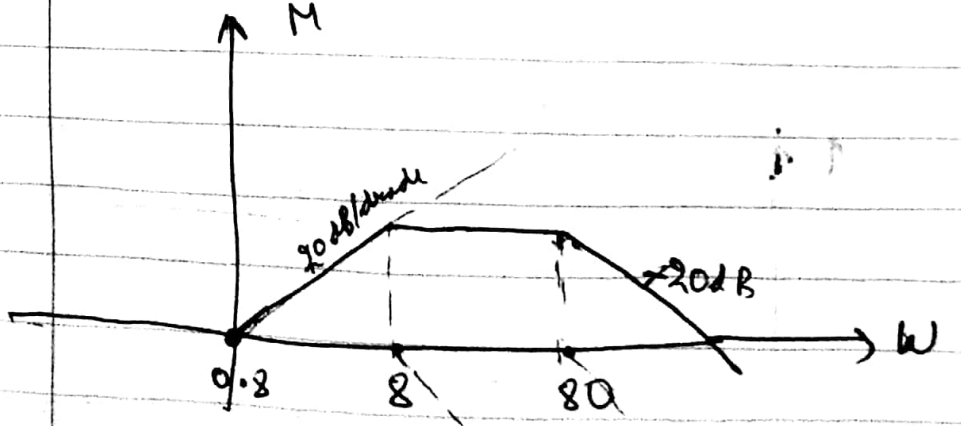
0.01 → 4

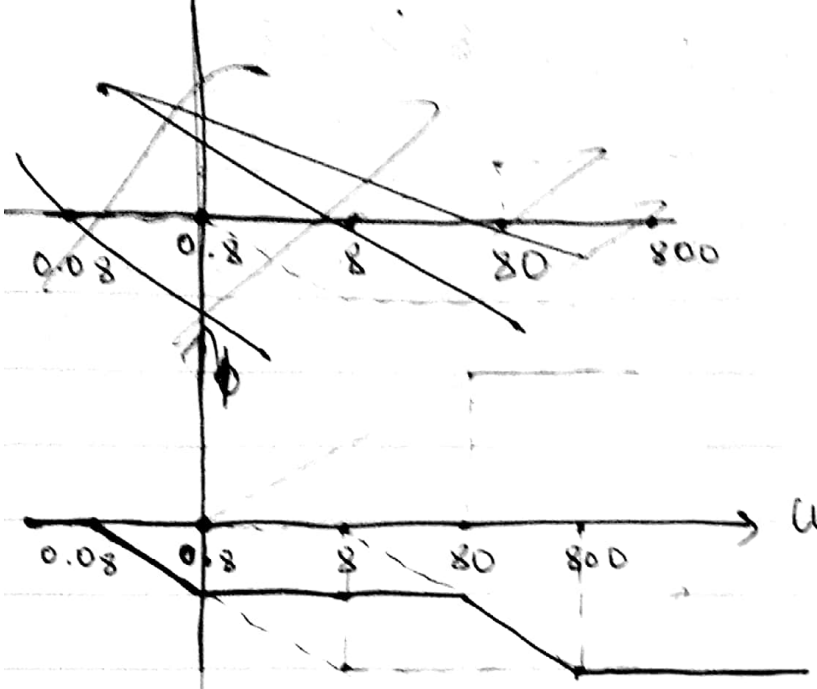
$\angle G(j\omega) = \angle(s+5) - (\bullet 180°) - \angle(s+1) - \angle s+10$

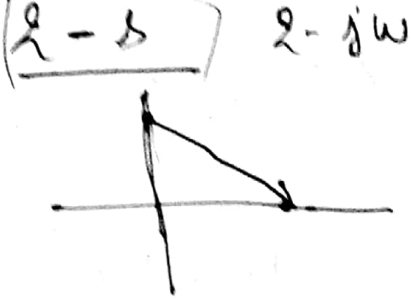




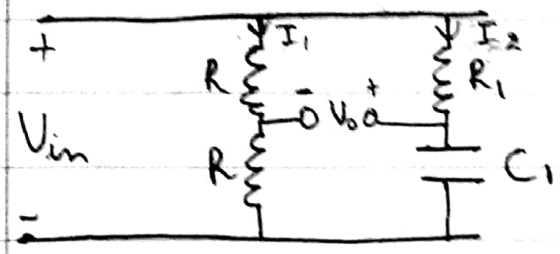
(d.) $G_1(s) = \dfrac{s+8}{(s+0.8)(s+80)}$







(3.)

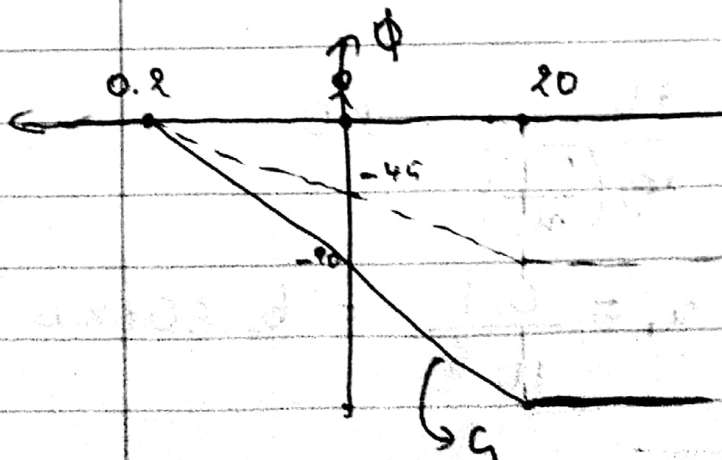


$$I_1 = \frac{V_{in}}{2R} \quad ; \quad I_2 = \frac{V_{in}}{R_1 + \frac{1}{sC_1}}$$

$$V_o = \frac{1}{sC_1} I_2 - R I_1 = \frac{V_{in}}{sC_1R_1 + 1} - \frac{V_{in}}{2}$$

$$G = \frac{V_o}{V_i} = \frac{2 - sC_1R_1 - 1}{2(sC_1R_1 + 1)} = \frac{1 - sC_1R_1}{2(1 + sC_1R_1)}$$

$$\Rightarrow G = \frac{\left(1 - \frac{s}{2}\right)}{2\left(1 + \frac{s}{2}\right)} \qquad H = \frac{1}{2} \text{ (constant)}$$

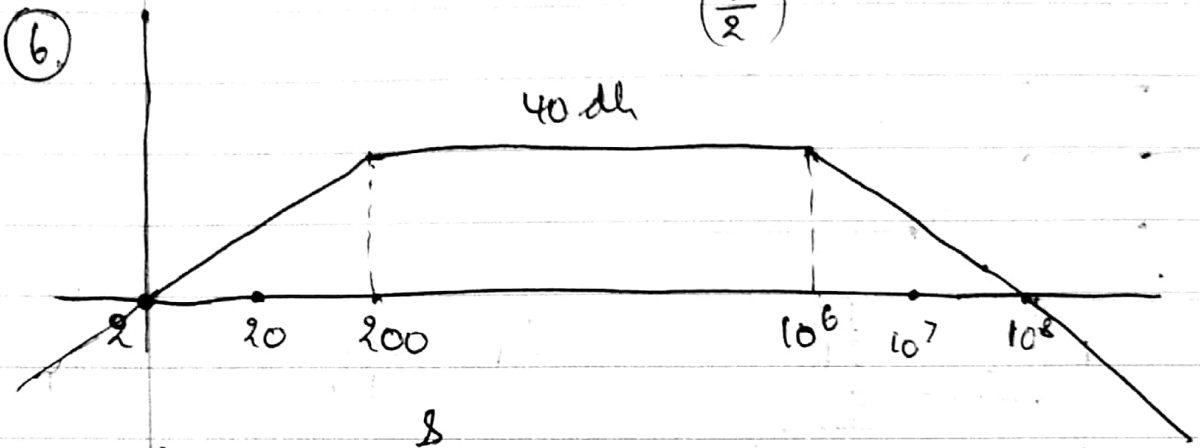


→ Zero Bode ($\frac{2-s}{2+s}$)

(4.) $G_1(s) = \dfrac{(s+2)}{s(2-s)}$ $\quad G_2(s) = \dfrac{s(3+s)}{s(3-s)}$

Bode Plots are similar to those calculated in (3)

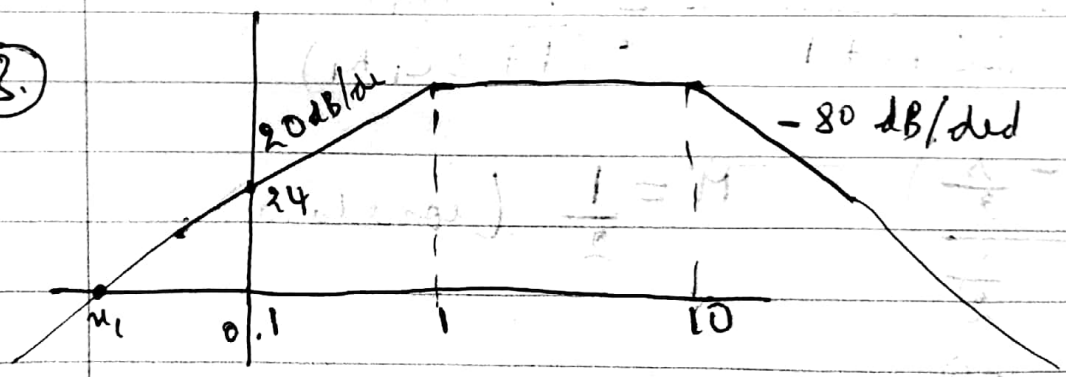
(6.)



$$G(s) = \frac{-\frac{s}{2}}{\left(1+\frac{s}{200}\right)\left(1+\frac{s}{10^6}\right)}$$

If $\omega = 0 \Rightarrow G = 0 \Rightarrow V_o = 0$

(8.)



$$\frac{y_2 - y_1}{\log x_2 - \log x_1} = 20 \Rightarrow \frac{24-0}{\log\left(\frac{0.1}{x_1}\right)} = 20$$

$$\Rightarrow \frac{24}{20} = \log\left(\frac{0.1}{x_1}\right) \Rightarrow x_1 = \frac{0.1}{10^{\frac{24}{20}}} = 6.309 \times 10^{-3}$$

$$\Rightarrow \boxed{G(s) = \frac{\frac{s}{6.309 \times 10^{-3}}}{(1+s) \times \left(1+\frac{s}{10}\right)^4}}$$