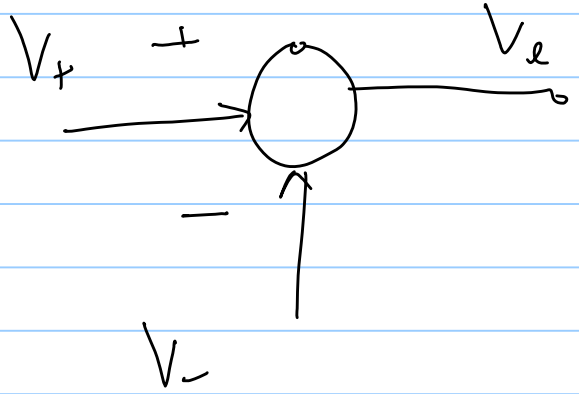
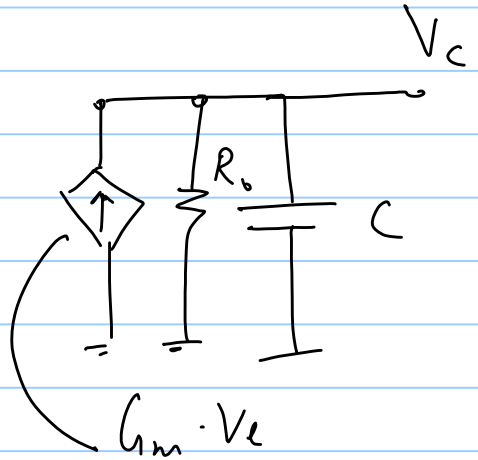
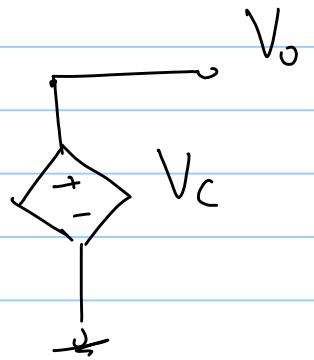
23/01/2019

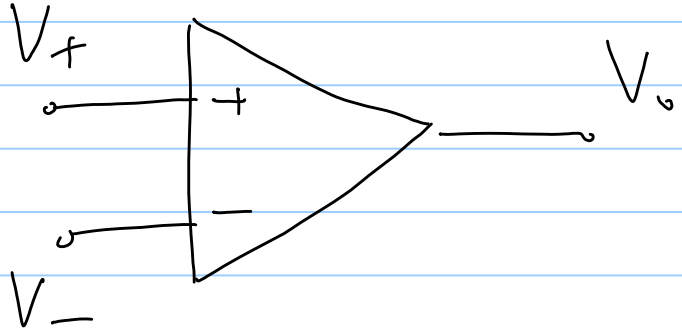
Lecture 4

Note Title 21-01-2019



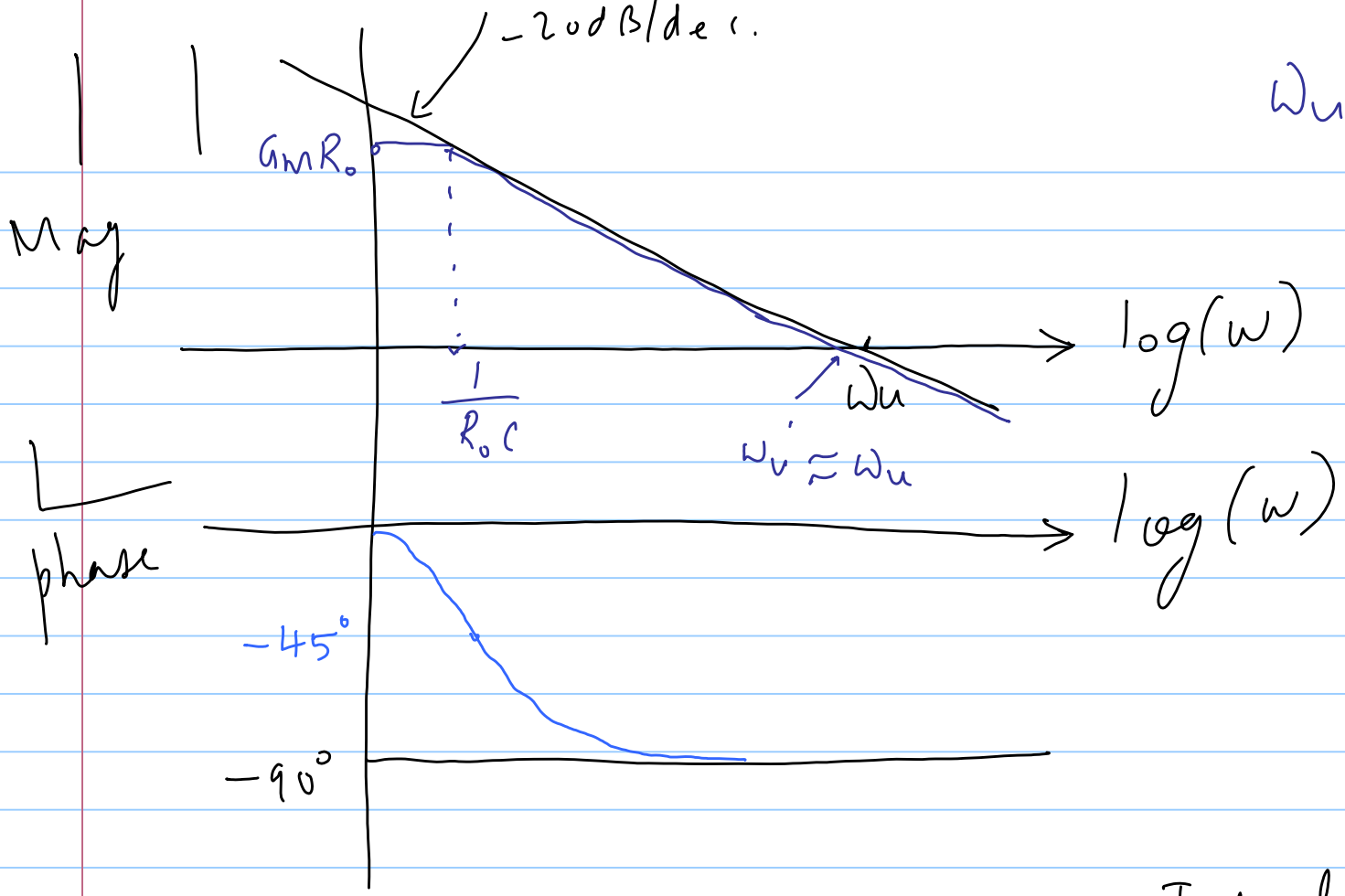




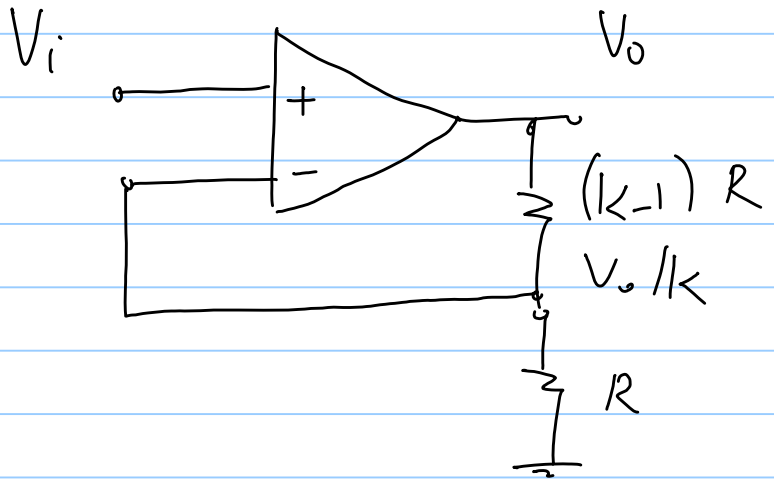


$$\frac{V_o}{V_+ - V_-}(s) = \frac{G_m R_o}{1 + sCR_o}$$

pole @ $-\frac{1}{R_o C}$



ω_u = unity gain frequency



Ideal: $V_o = k V_i$

Non-ideal opamp

Opamp $H(s) = \dfrac{G_m R_o}{1 + s C R_o}$

$$\frac{V_o}{V_i}(s) = \frac{G_m R_o k}{k + G_m R_o + sCR_o k}$$

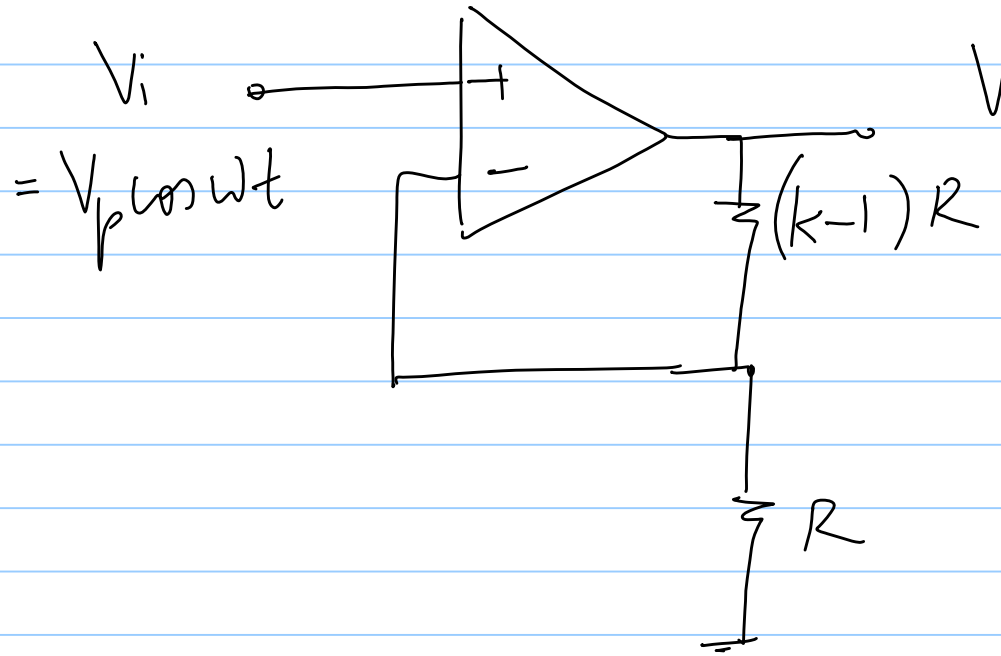
$$\frac{V_o}{V_i}(s) = \frac{G_m R_o k}{k + G_m R_o + sCR_o k} = k \cdot \left(\quad \right)$$

$$= k \cdot \frac{G_m R_o}{k + G_m R_o + sCR_o k}$$

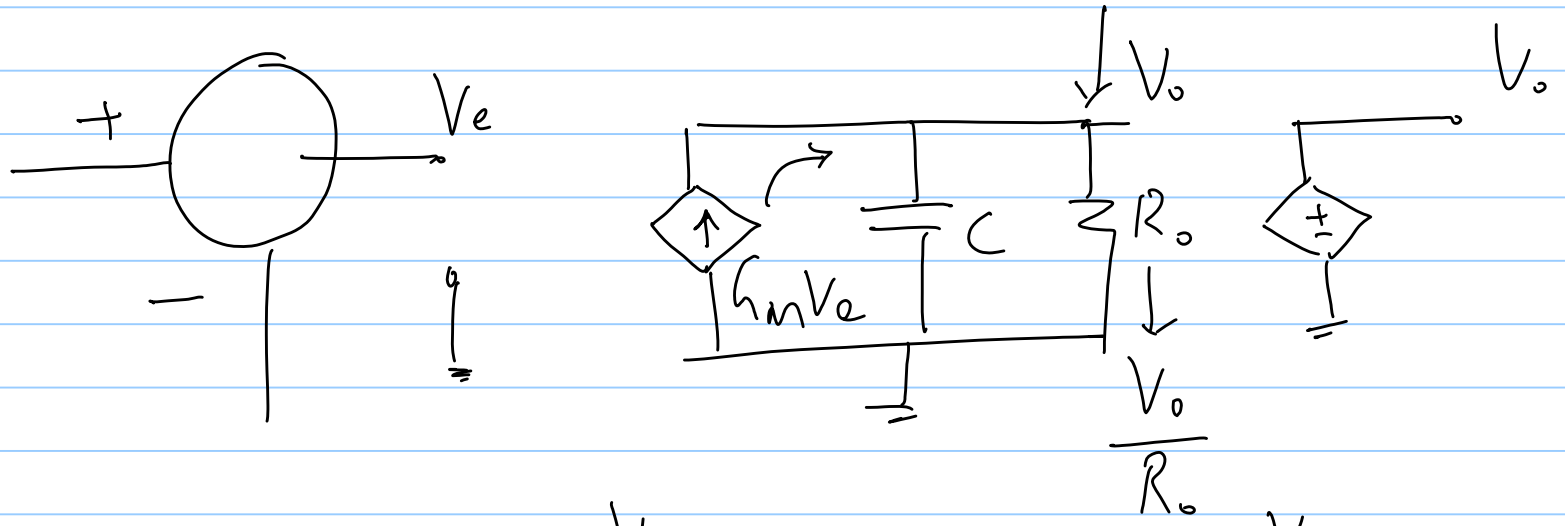
$$= k \cdot \frac{1}{1 + \frac{k}{G_m R_o}(1 + sCR_o)}$$

closed loop UGF $\omega_{u_{CL}} =$ ⟶ HW ($s = j\omega$, $|H(j\omega)| = 1$)

$$\frac{V_e(s)}{V_i(s)} = \frac{k(1 + sCR_o)}{k + G_m R_o + k sCR_o} \; ?$$



$V_o = k V_p \cos \omega t$ (ideally)



$$G_m V_e = \frac{V_o}{R_o} \Rightarrow V_e = \frac{V_o}{G_m R_o}$$

Small $\omega \longrightarrow$ error is almost same as DC case