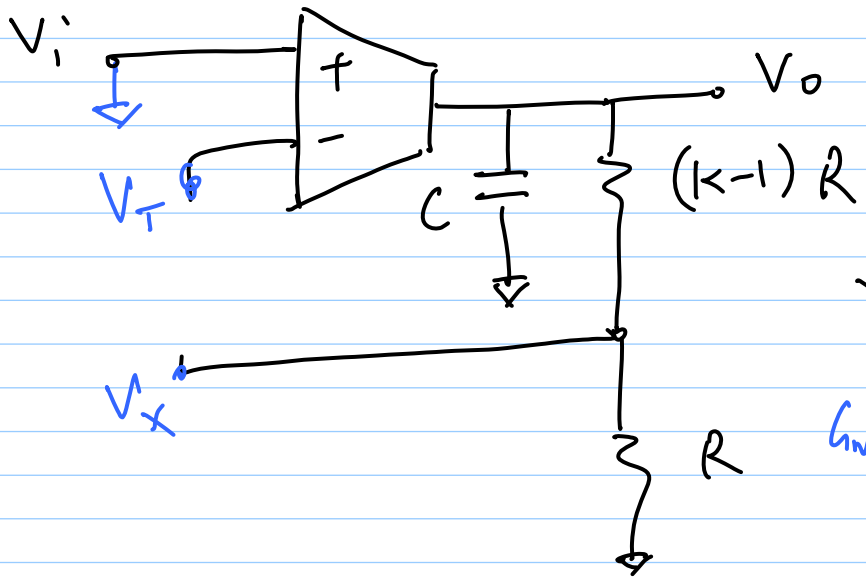
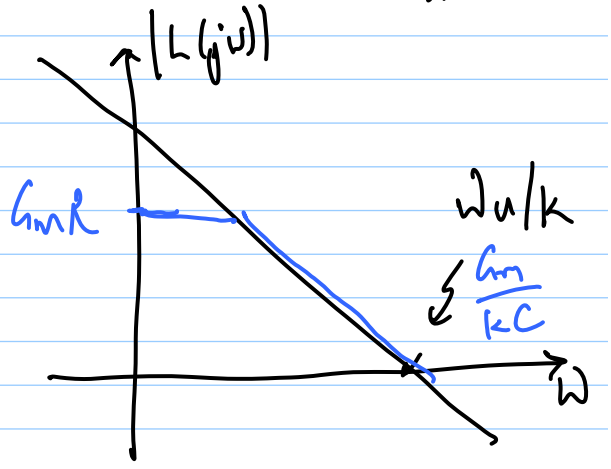
18-2-13

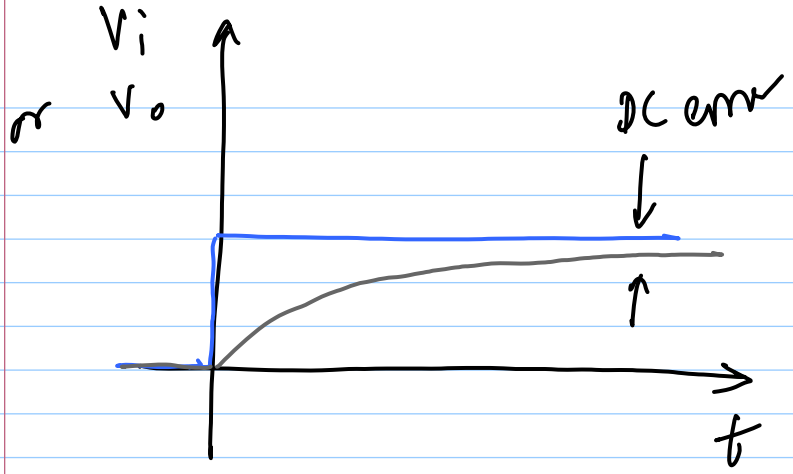
Lec 22



DC gain $= \frac{G_m \cdot (kR)}{k} = G_m \cdot R$



$\omega_{p_1} = \frac{1}{kRC}$; $\omega_u = \frac{G_m}{C}$



$\uparrow G_m$ → $\uparrow I$ X, $\uparrow (W/L)$ or $\uparrow R$ or both

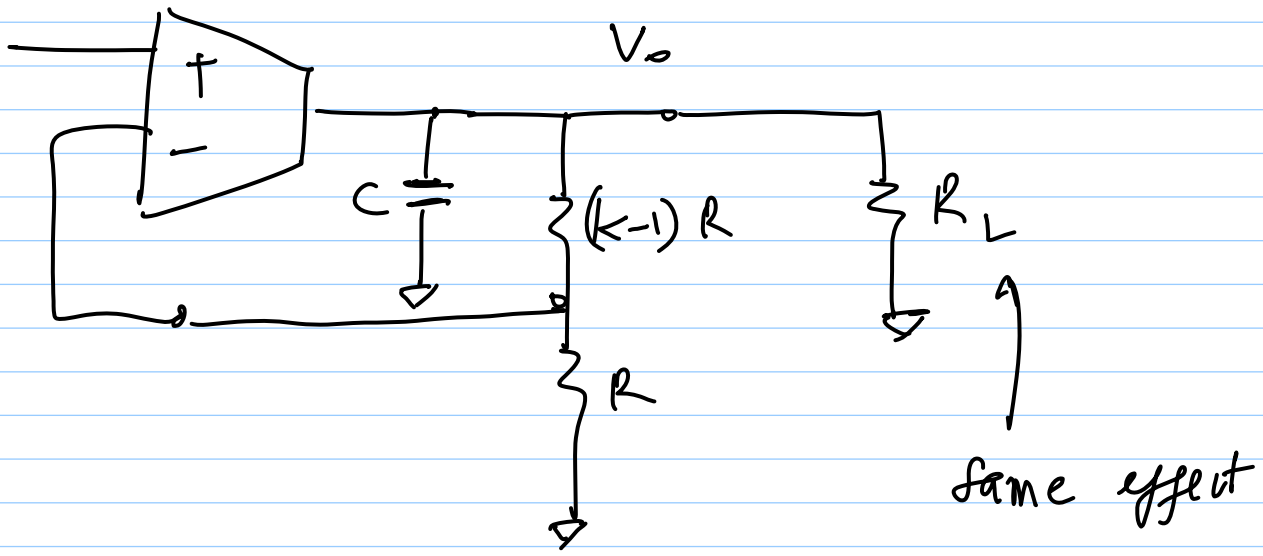
$\uparrow (W/L) \Rightarrow \uparrow$ parasitic cap

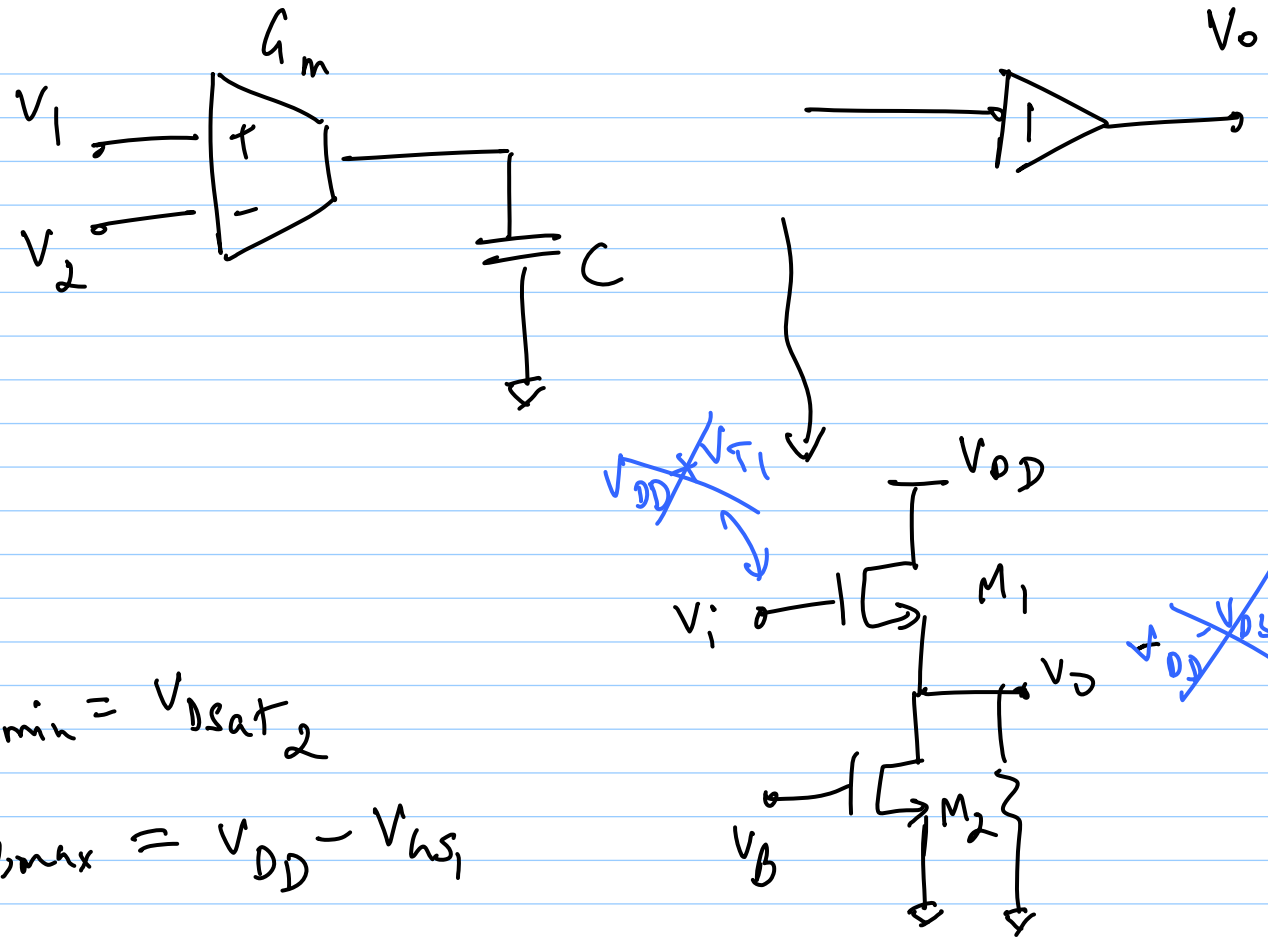
$\Rightarrow$ speed $\downarrow$

$$\frac{V_o}{V_i}(A) = \frac{G_mR}{1+G_mR} \cdot k \cdot \frac{1}{1+\frac{skRC}{1+G_mR}}$$

$G_mR \gg 1$

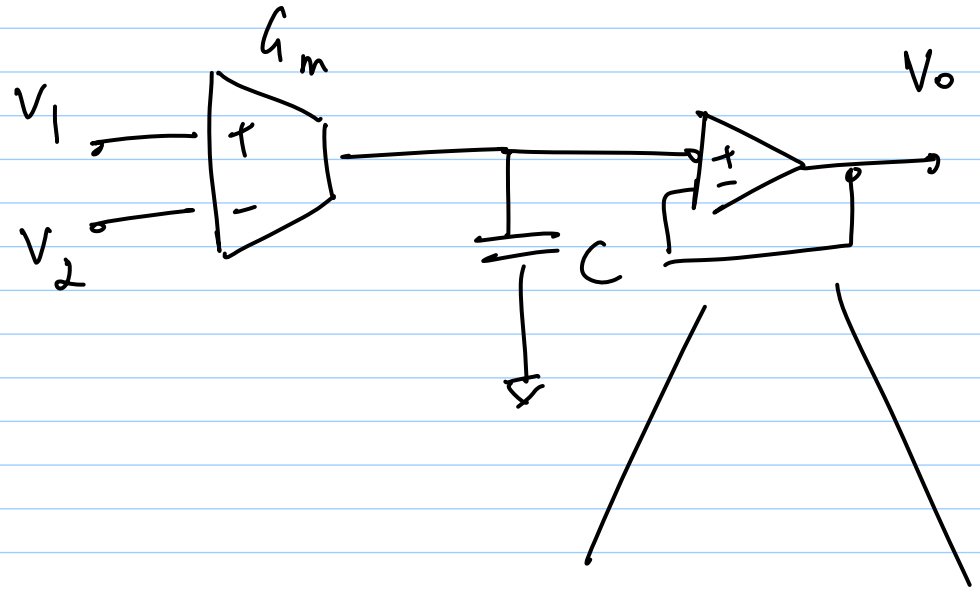
$$CL_4 = k \cdot \frac{1}{1+\frac{skC}{G_m}}$$

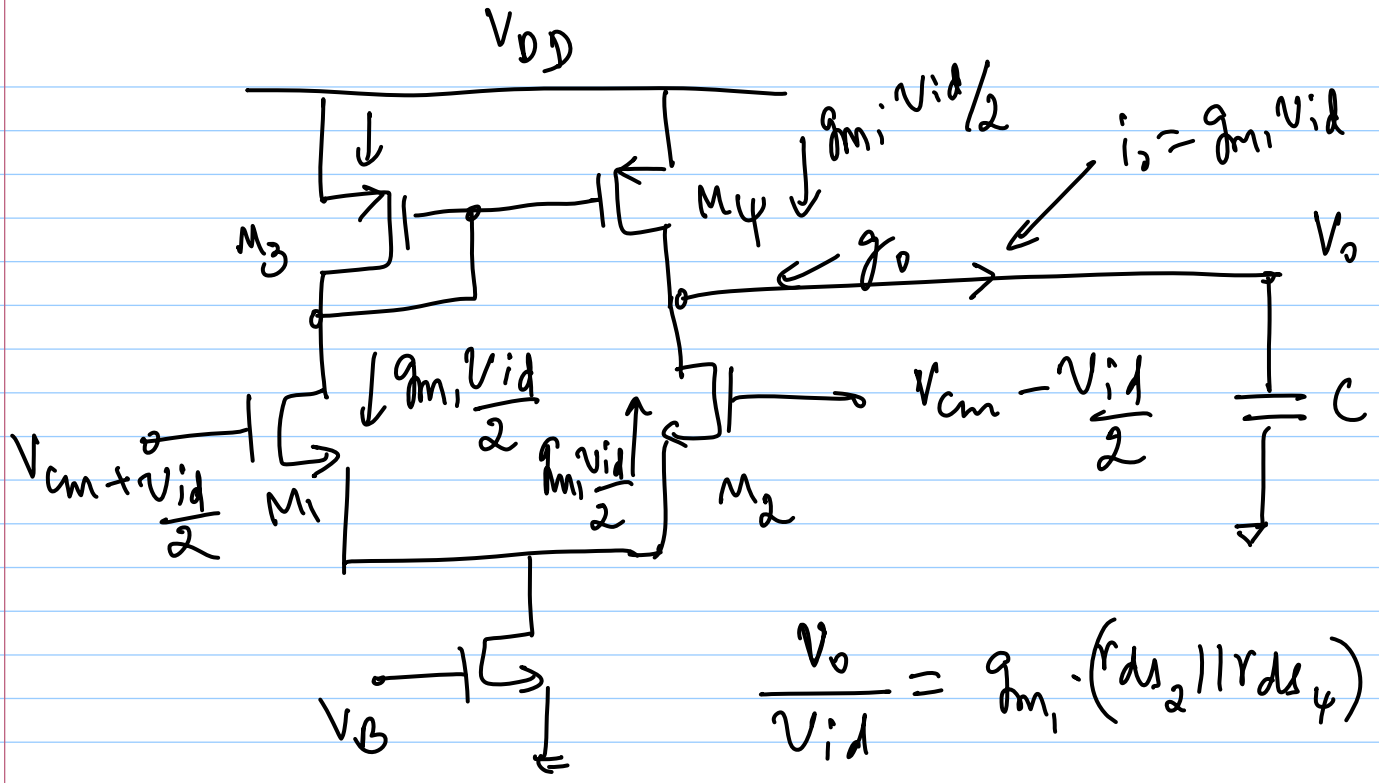




$V_{o,min} = V_{Dsat_2}$

$V_{o,max} = V_{DD} - V_{GS_1}$

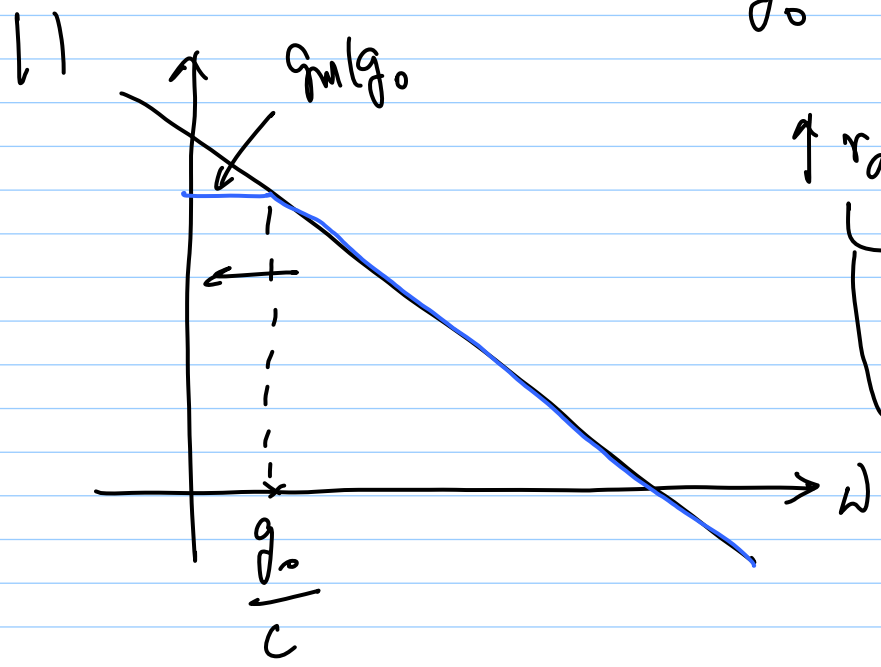




$$\frac{V_o}{v_{id}} = g_{m_1} \cdot (r_{ds_2} \| r_{ds_4})$$

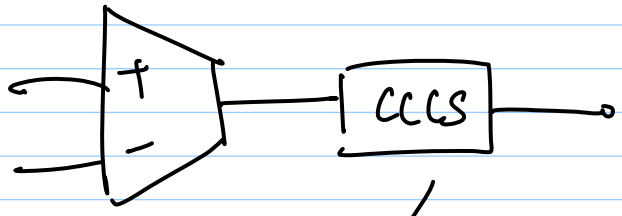
w/ cap. $\Rightarrow$ $\quad v_o = \frac{g_m}{sC} \cdot v_{id}$

$$\frac{v_o}{v_{id}}(s) = \frac{g_m}{sC + g_o}$$

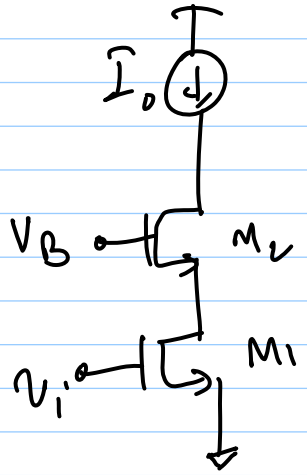


$\uparrow r_{ds}$ → $\downarrow I$ but $g_m \downarrow$

→ $\uparrow L$ but par. cap. $\uparrow$



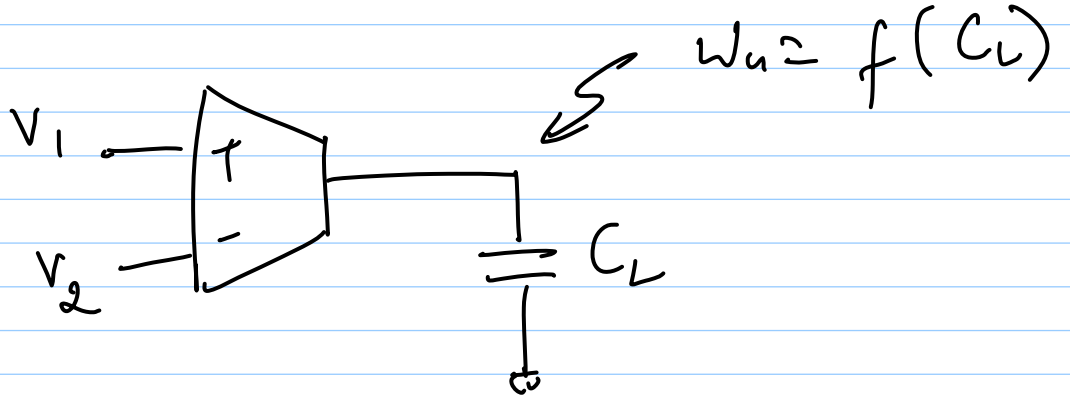
CG amplifier.



⇒ use this in single-stage opamp.

Single stage opamps

1) Don't drive resistive loads



2) 1-stage
- Diff pair (simple)
- telescopic opamp
- folded cascode opamp