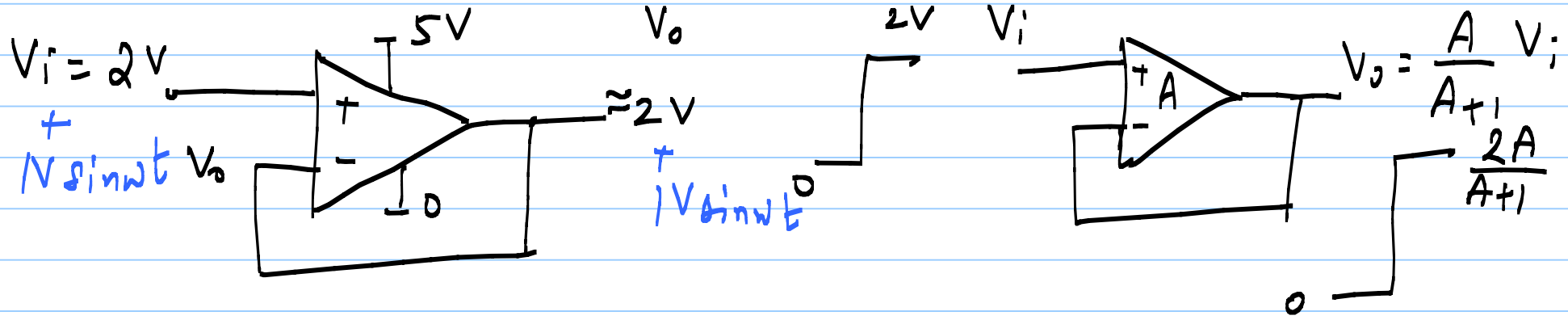
9/10/2020

Lecture 36



$A = 100$

here $V_o = \frac{100}{101} \cdot 2V$

$$V_{CM} = \frac{V_+ + V_-}{2} = \frac{V_i + V_o}{2} = \frac{1}{2}\left[V_i + \frac{100}{101} V_i\right]$$

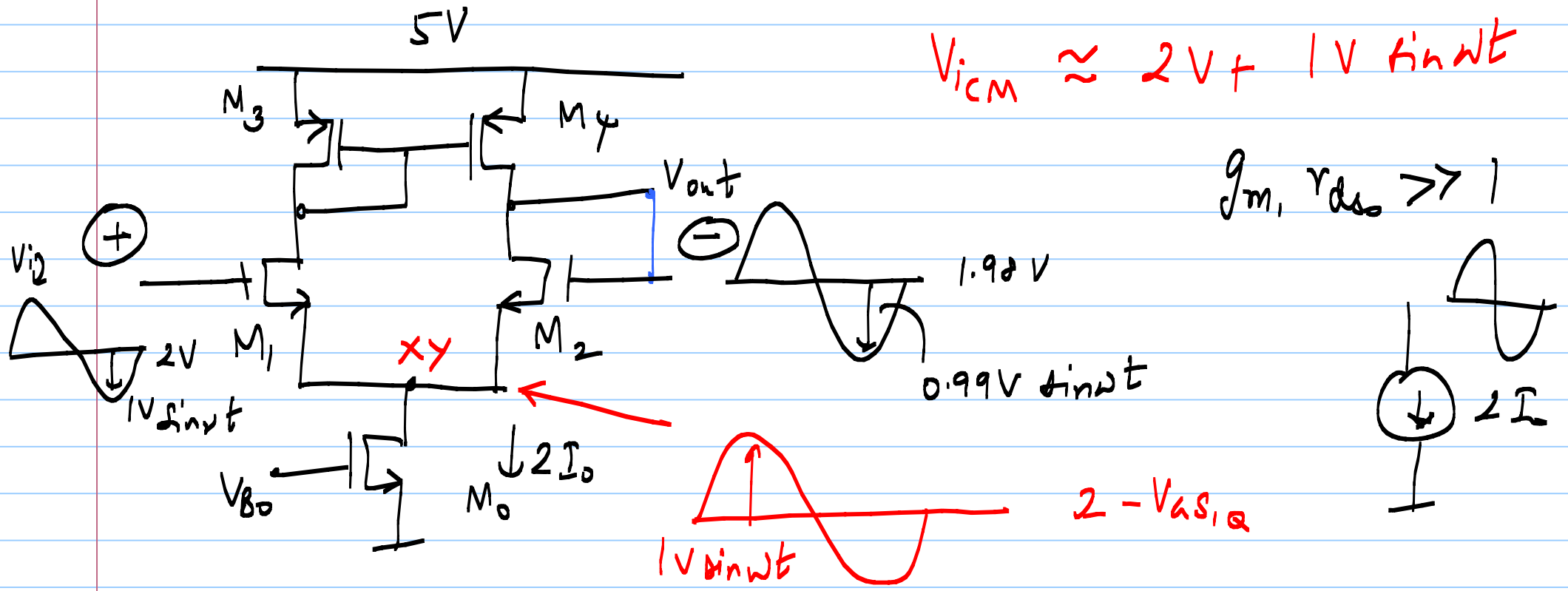
$$= \frac{201}{202} \cdot V_i \simeq V_i$$

$$V_{Dm} = \frac{V_+ - V_-}{2} = \frac{V_i - V_o}{2} = \frac{1}{2}\left[V_i - \frac{100}{101} V_i\right]$$

$$V_{DM} = \frac{V_i}{2} \cdot \frac{1}{101} = \frac{V_i}{202}$$

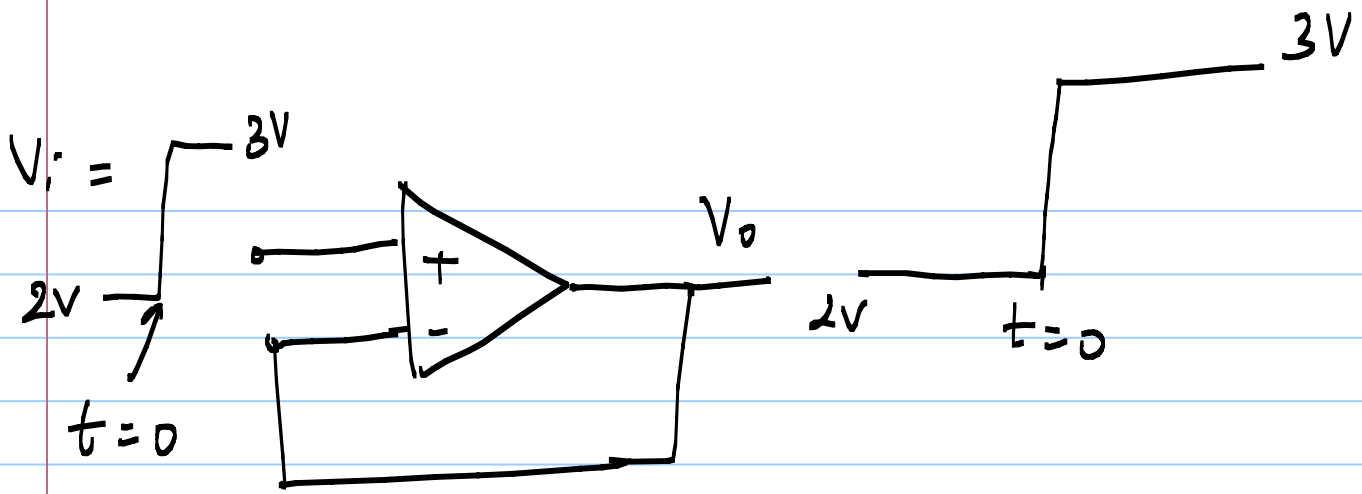
$$V_+ = V_{CM} + V_{DM} = \frac{201}{202} V_i + \frac{V_i}{202} = V_i$$

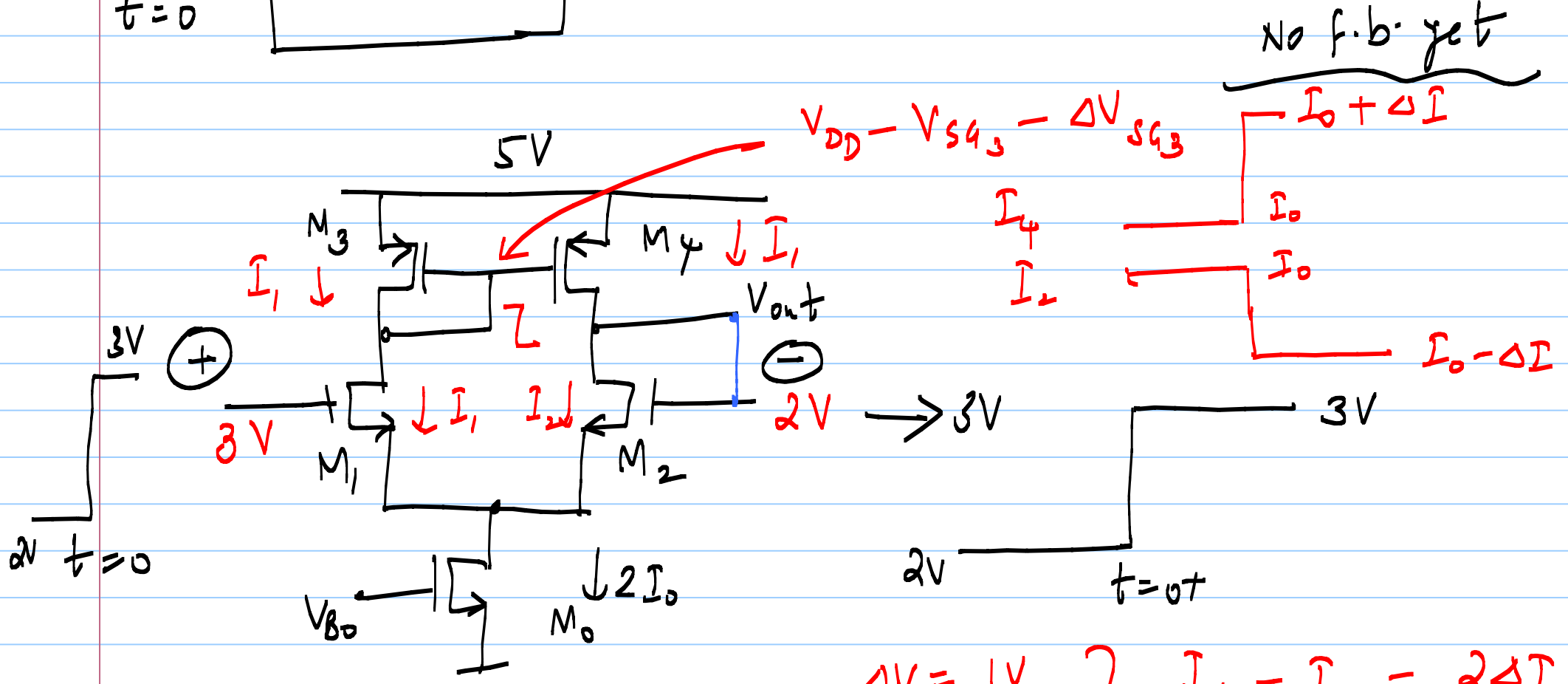
$$V_- = V_{CM} - V_{DM} = \frac{100}{101} V_i$$



$V_{iCM} \simeq 2V + 1V \sin\omega t$

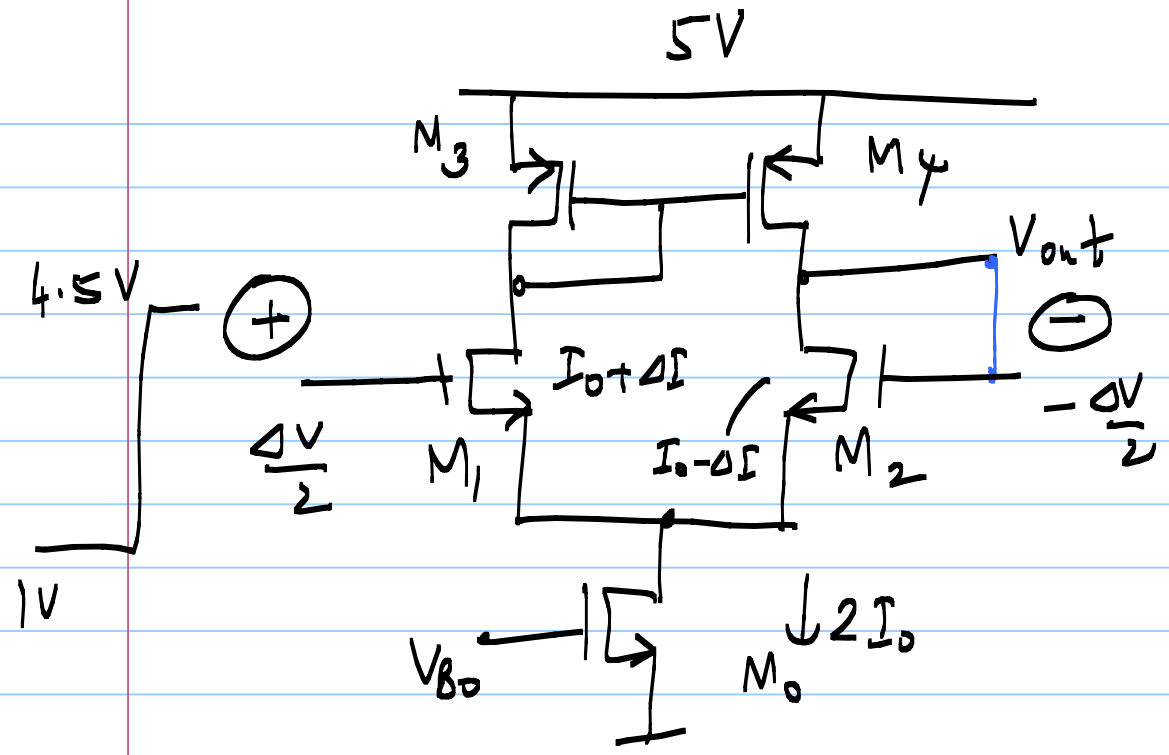
$g_{m_1} r_{ds_0} >> 1$





$$I_1 = I_0 + \Delta I \quad ; \quad I_2 = I_0 - \Delta I$$

$$\left.\begin{array}{l} \Delta V = 1V \\ \end{array}\right\} \quad I_4 - I_2 = 2\Delta I$$



ΔI depends on $\frac{\Delta V}{2}$

larger $\frac{\Delta V}{2}$ → larger ΔI

small signals: $\Delta I = g_{m_1} \frac{\Delta V}{2}$

large signals (large ΔV)

larger $\frac{\Delta V}{2}$ → larger ΔI

still true

$M_2 = 0$

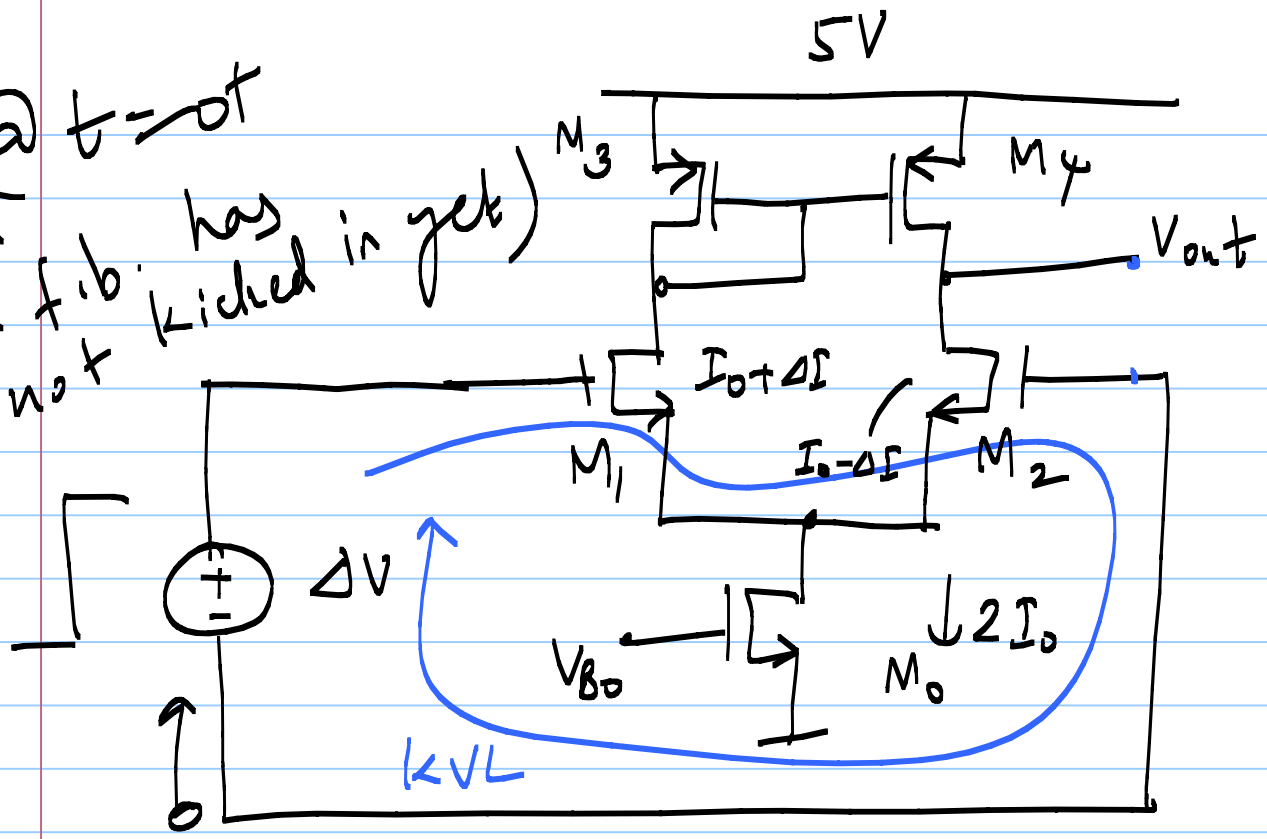
largest possible $\Delta I = I_0$ $\{ I_1 = 2I_0, I_2 = 0 \}$

Beyond this: larger ΔV $\not\Rightarrow$ larger ΔI

@ t = 0+

(fb has kicked in yet)

not



KVL

$+\Delta V - V_{GS_1} + V_{GS_2} = 0$

$\Delta V = V_{GS_1} - V_{GS_2}$