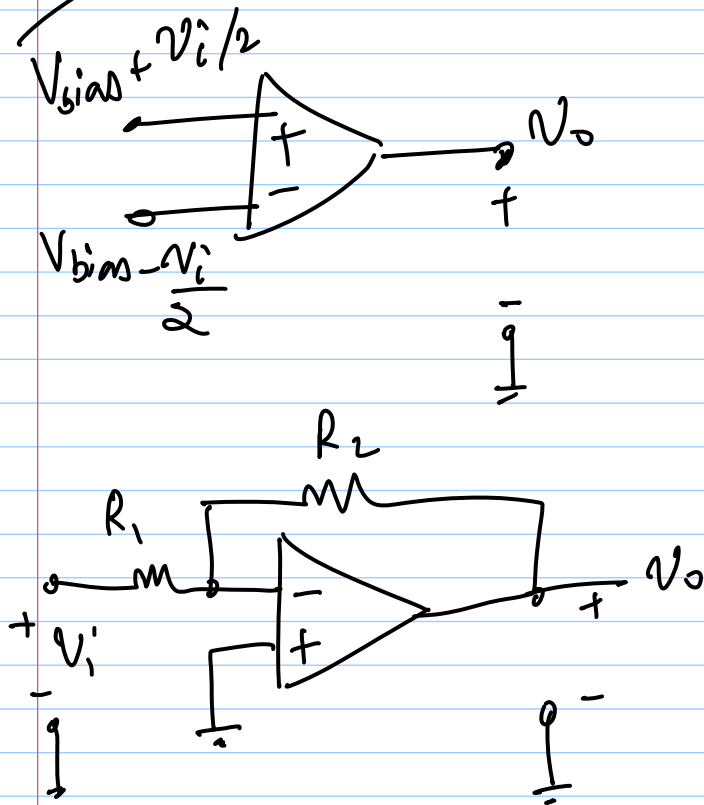


21-3-12

Lec 32

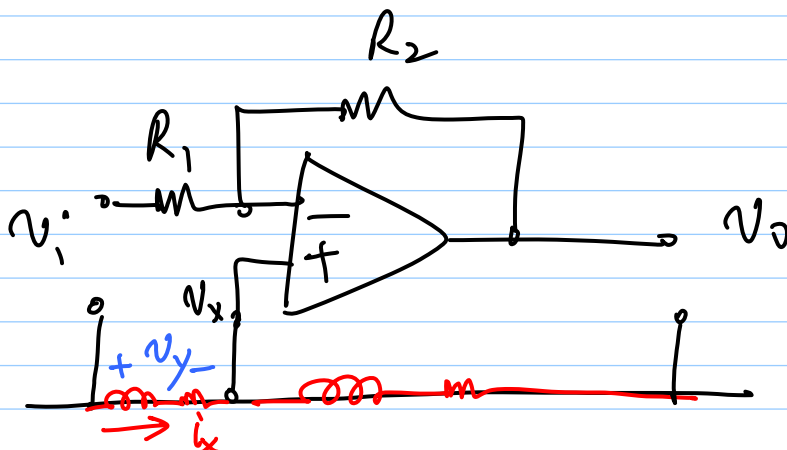


both

input &

o/p are

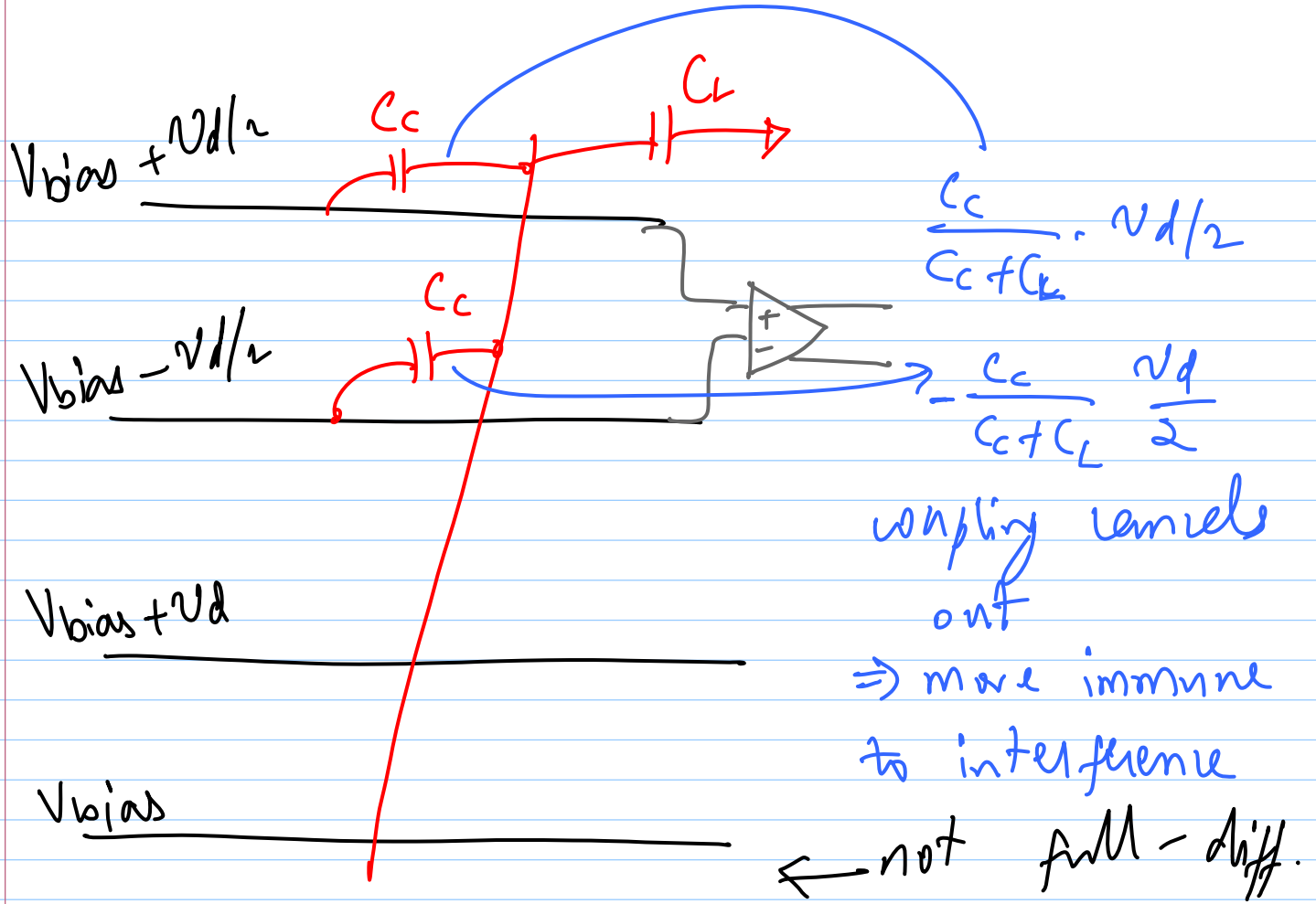
defined w.r.t -
gnd



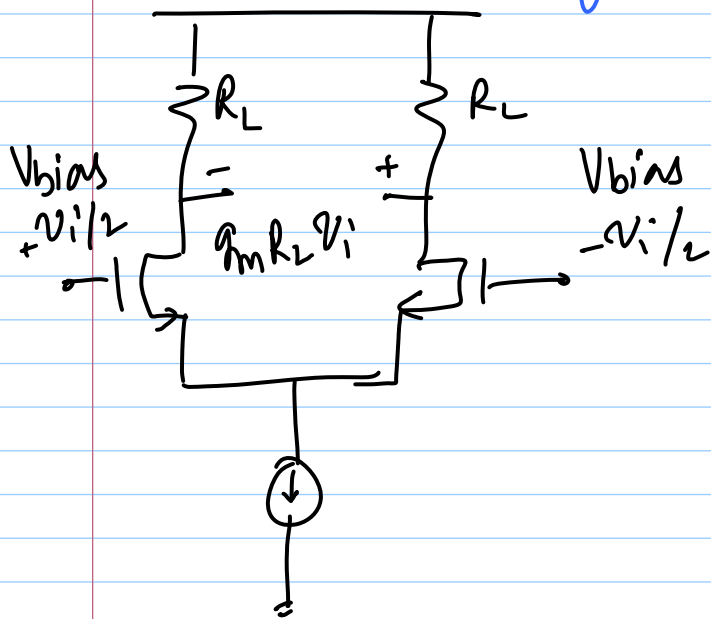
$$V_i' = V_i - V_x \Rightarrow V_o = -\frac{R_2}{R_1} \cdot V_i'$$

$V_y \Rightarrow$ depends on some other ckt!

* Motivation for fully differential cts.



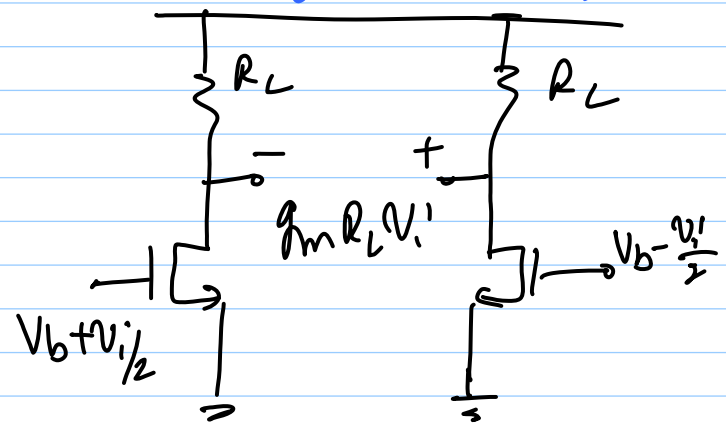
CM gain < DM gain



fully diff.

V_{bias} change does not affect gain, V_{out}

CM gain = DM gain

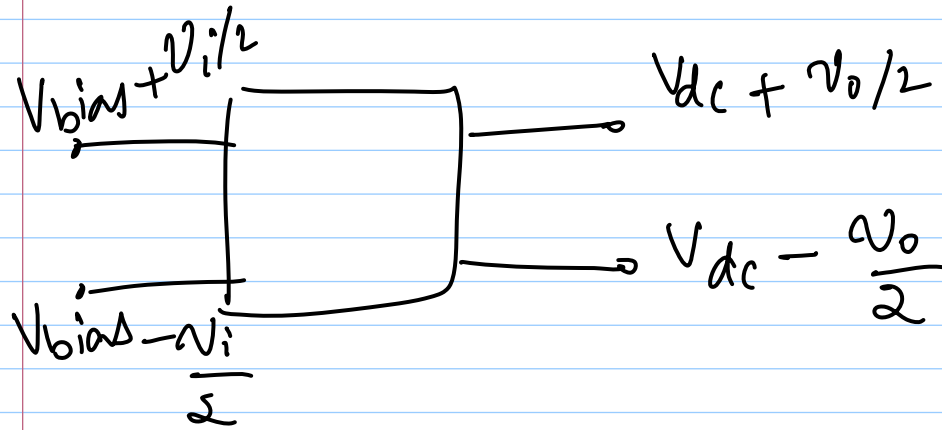


pseudo diff.

* sensitive to V_b
 V_{out} , gain = $f(V_b)$
 $\Rightarrow$ sensitive to CM

clt 2 $\Rightarrow$ amplifies both cm & diff. mode

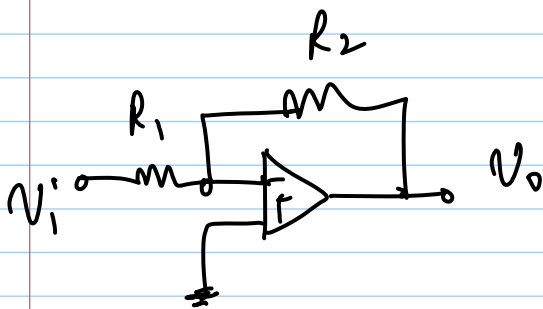
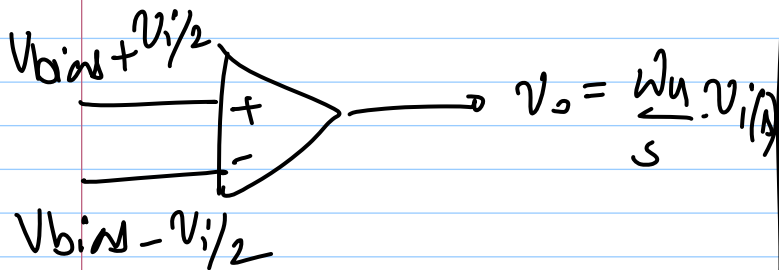
clt 1 $\Rightarrow$ has CM Rejection



why?

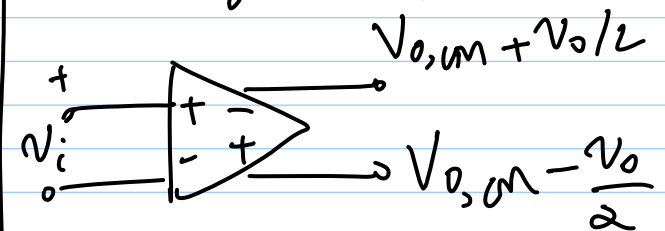
$\rightarrow$ less sensitive to C.M. signals (noise, coupling etc.)

S.E. Opamp

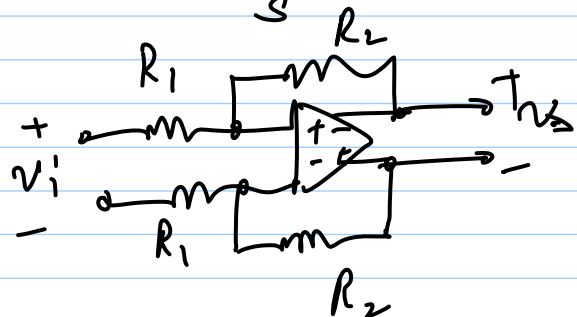


f.b. is not sensitive to CM signals

Fully Diff Opamp

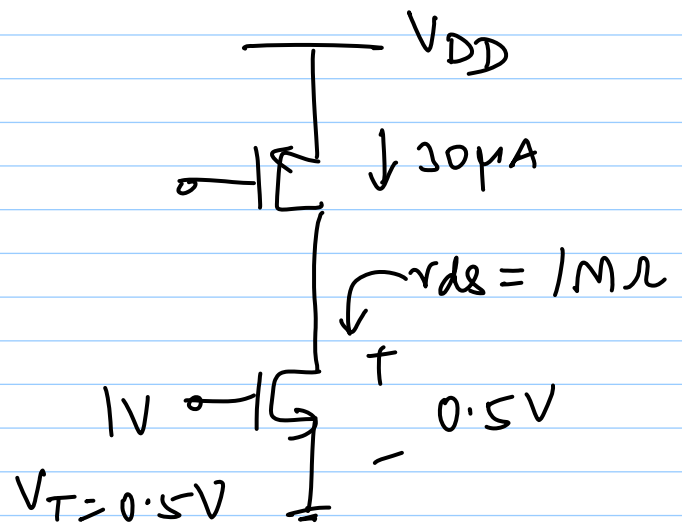
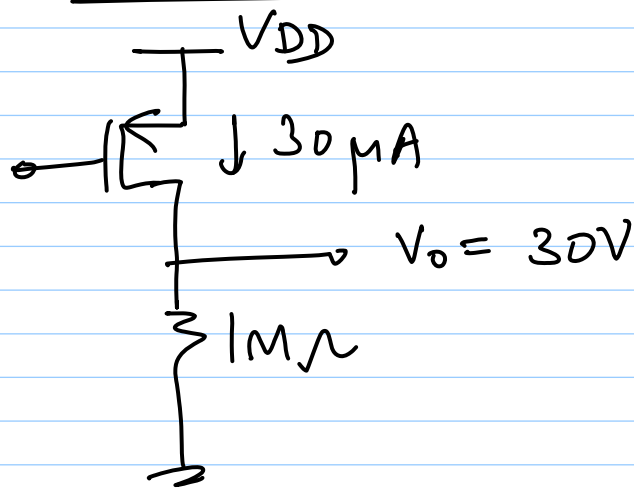


$$v_o = \frac{w_u}{s} \cdot v_i(s)$$

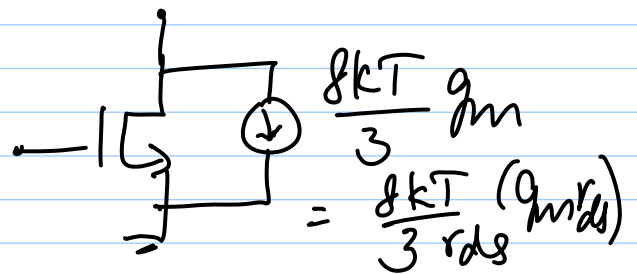
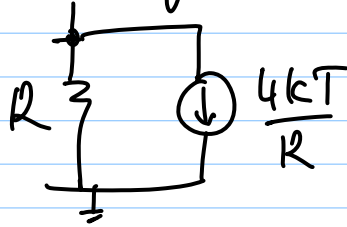


f.b. loop acts even for CM

Active load



Price to pay:

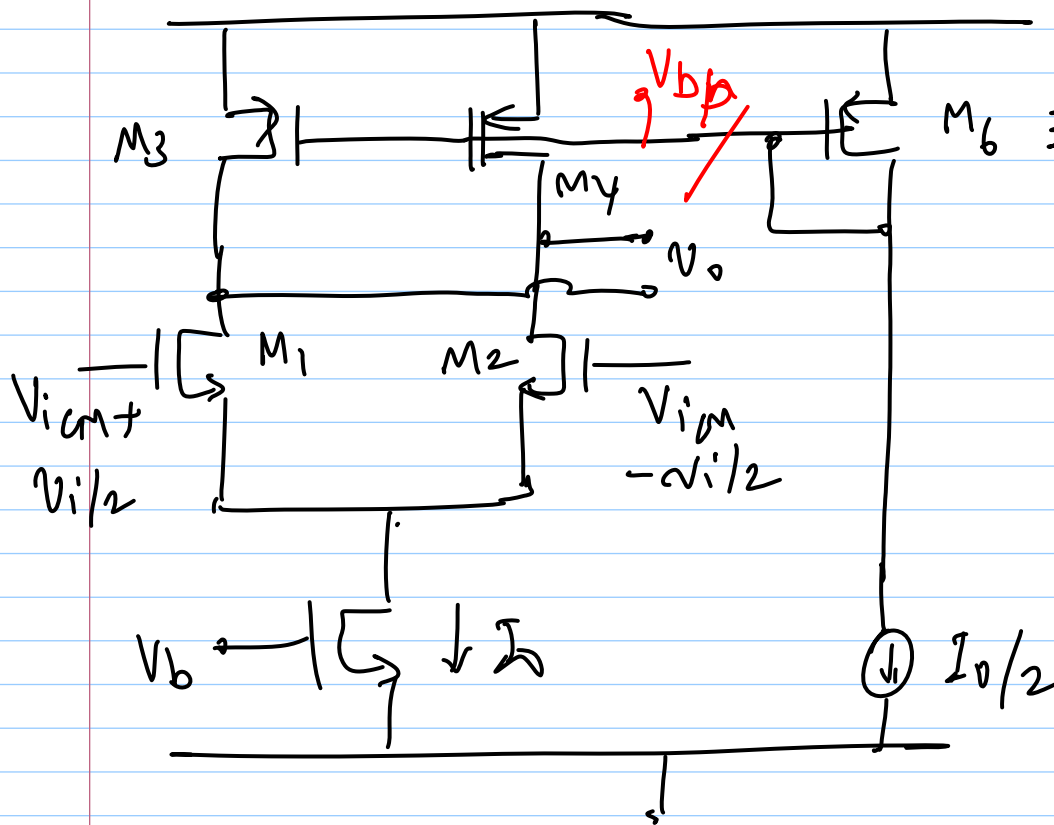


* much larger noise w/ active load

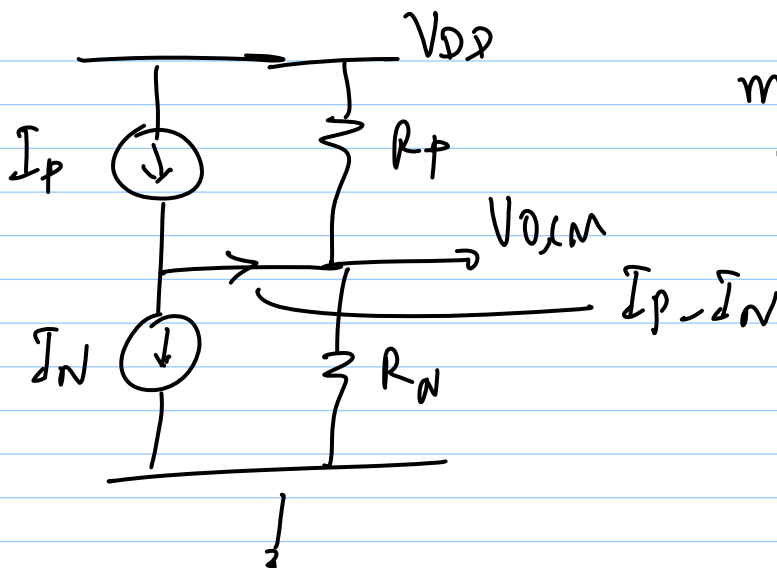
$$* g_m = \frac{2I_D}{V_{DSAT}}$$

lower voltage $\Rightarrow$ lower V_{DSAT}

$\Rightarrow$ larger $g_m \Rightarrow$ more noise!



$V_{o,cm}$ is not well defined



mismatches cause huge variations in $V_{O,CM}$

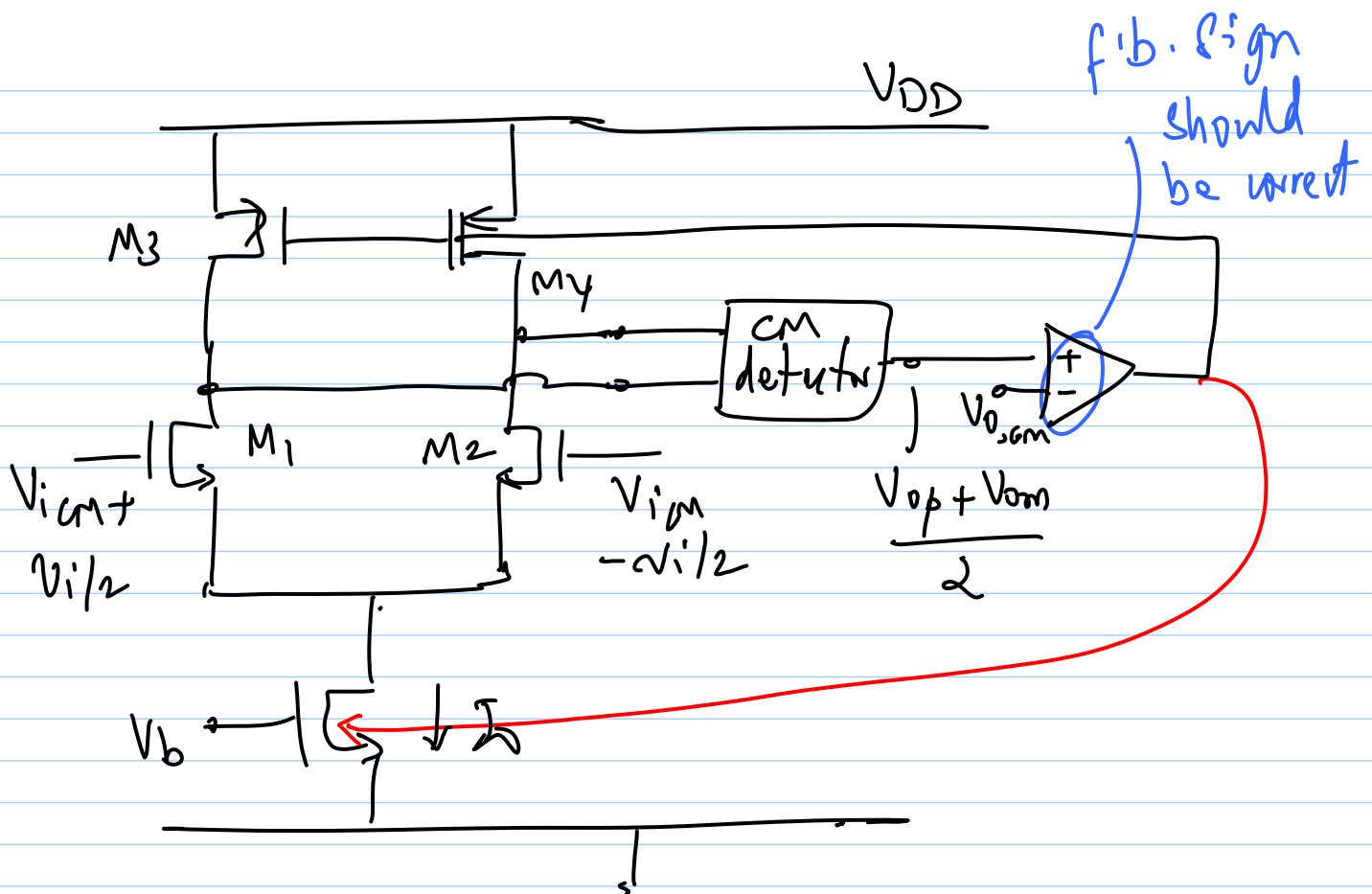
e.g. If $I_{3,4} > I_{1,2} \Rightarrow V_{O,CM}$ will $\uparrow$
to push $M_{3,4}$ into triode

⇒ Need CM feedback (CMFB)

* adjust V_{bp} so that currents

are equal

→ or adjust V_{bn}



CMFB

