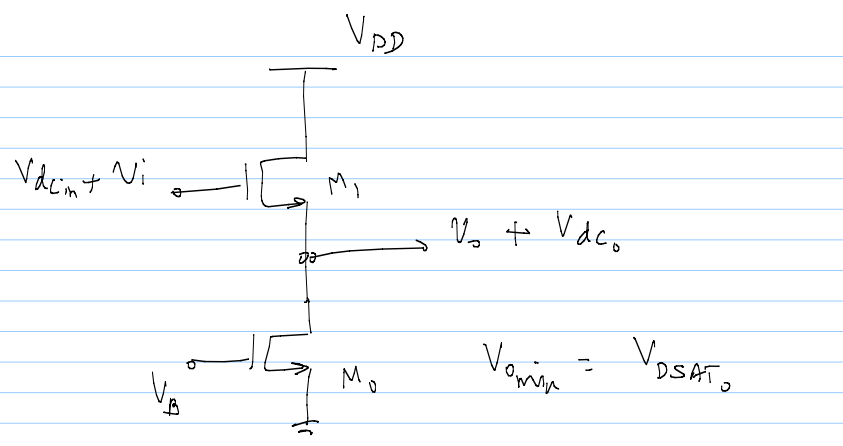
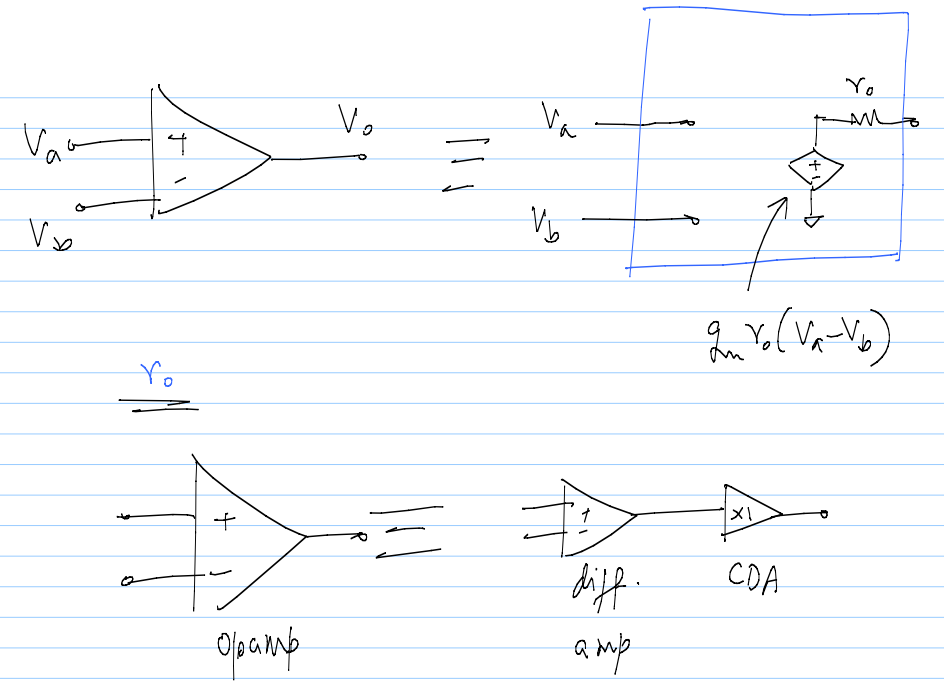
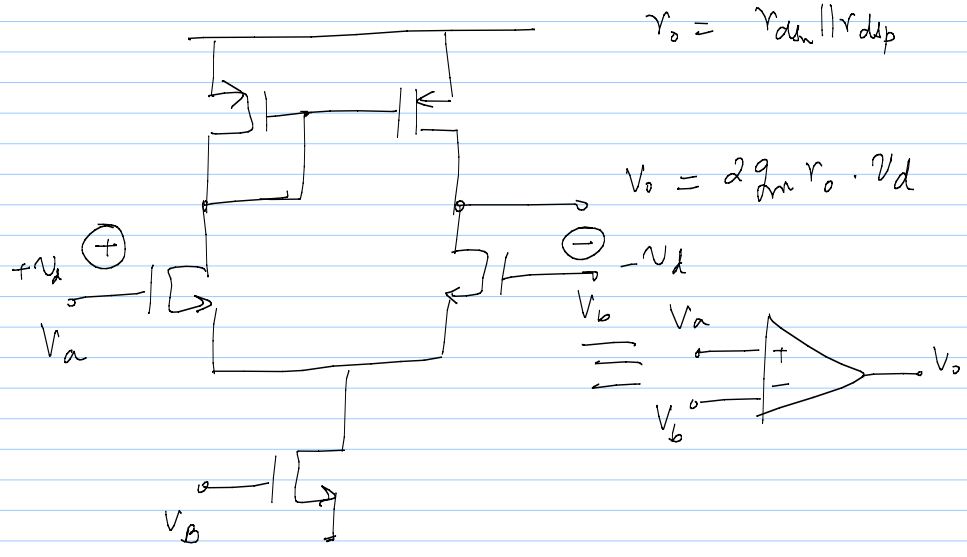


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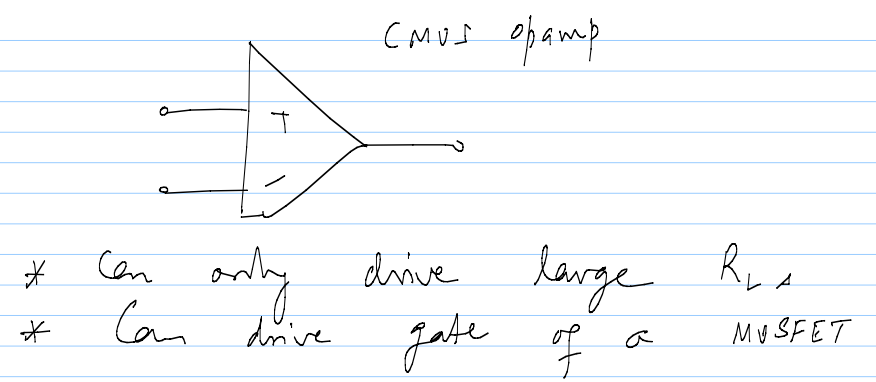
lec 39



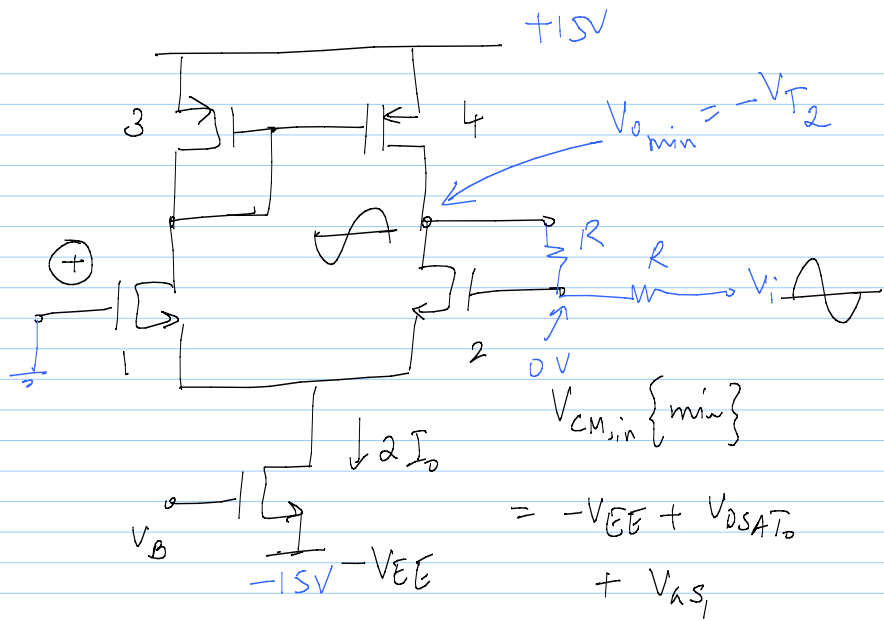
Can  $V_{omax}$  be  $= V_{DD} - V_{DSAT_1}$

for this  $V_{in, max} = V_{DD} - V_{DSAT_1} + V_{as1}$

$= V_{DD} + V_{T1}$  ← not possible

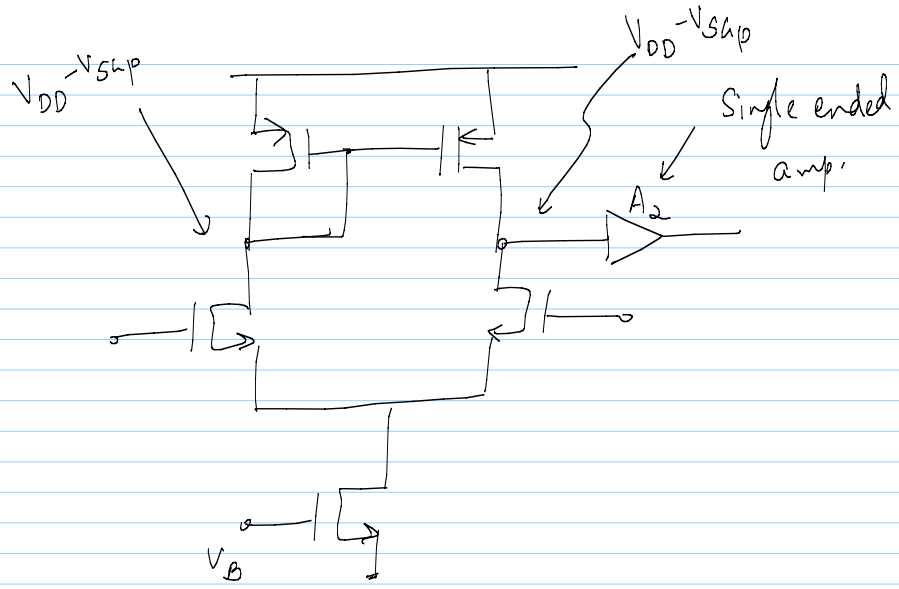
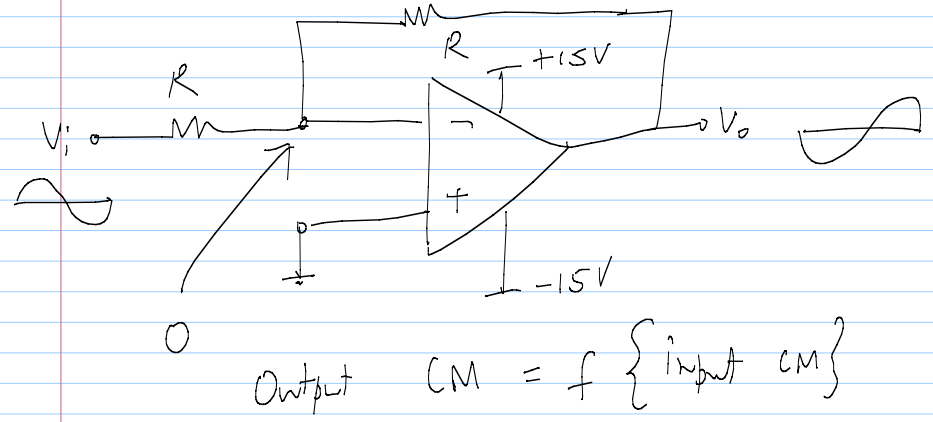


- \* Can only drive large  $R_L$
- \* Can drive gate of a MOSFET

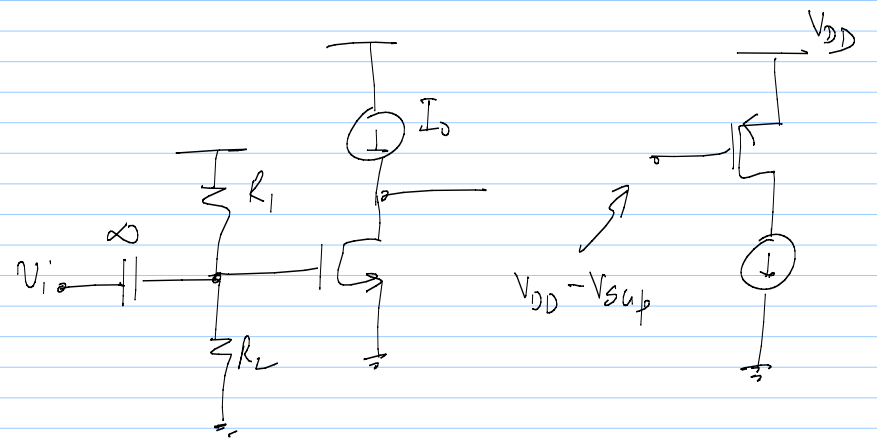


Limitations

- 1) limited gain :  $g_m V_o \approx 100$
- 2)  $V_{o, \min} = V_{Q, in} - V_{T_{1,2}}$



$A_2$  - CSA



# 2-stage opamp

