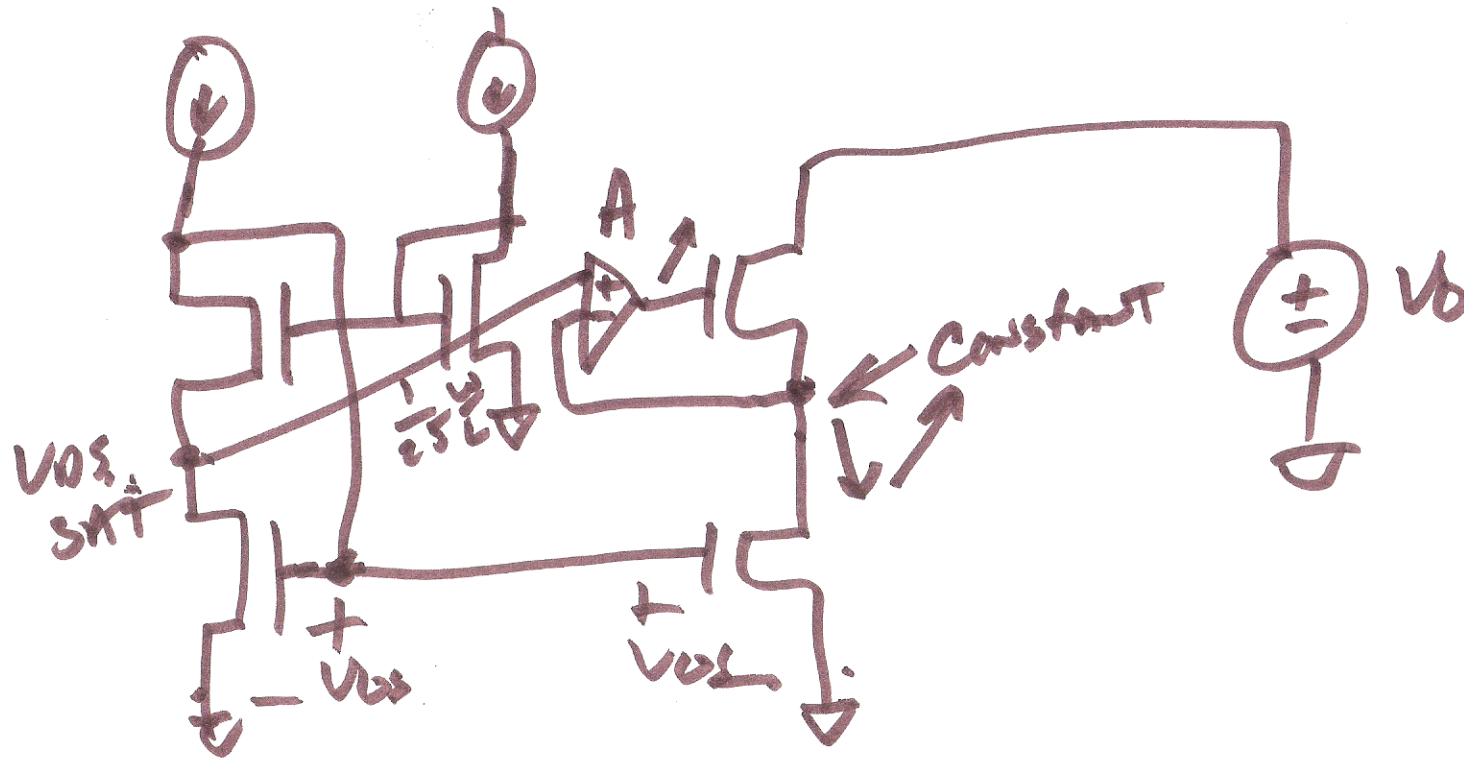


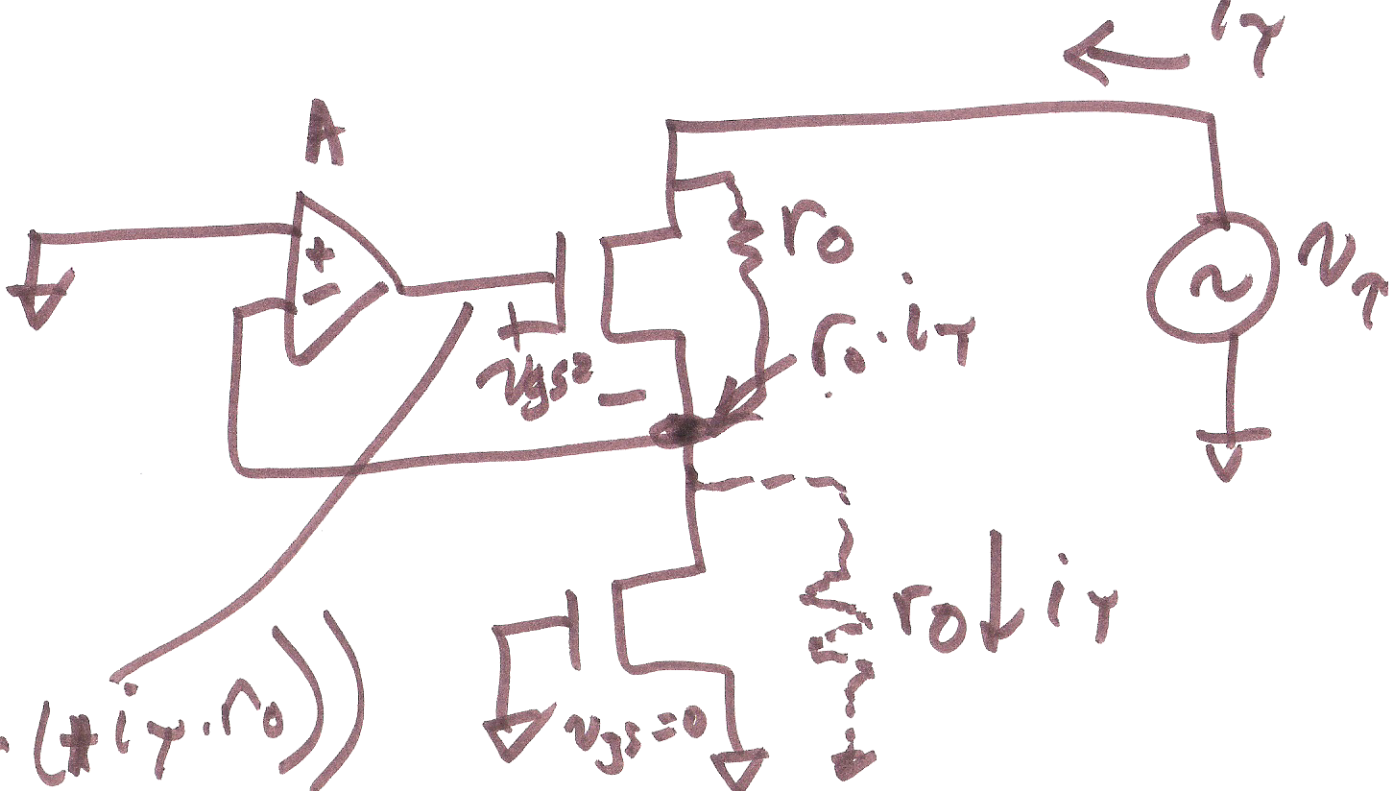
wide-swing current mirror

2)

# Regulated Drain topology



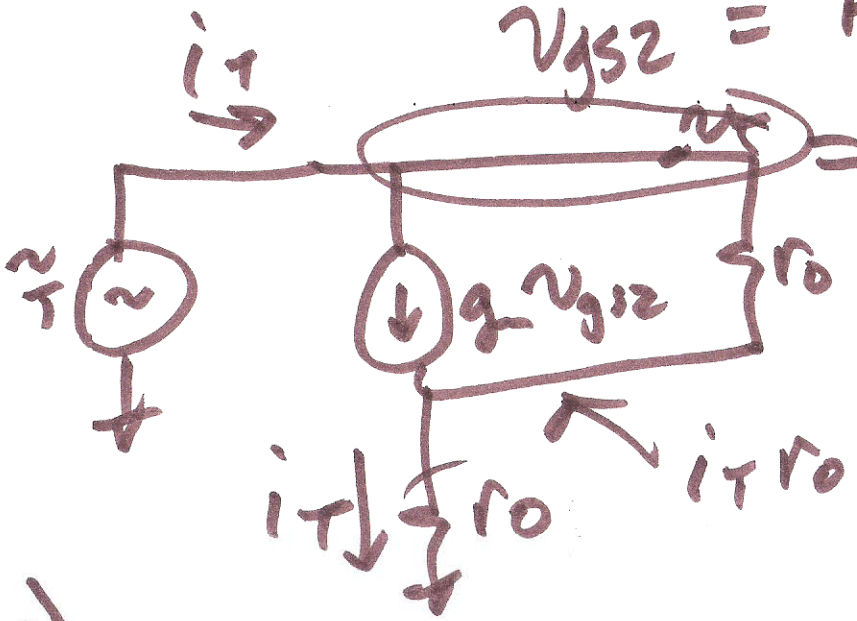
3)



$$A(0 - (i_T \cdot r_o))$$

$$v_{gs2} = -A i_T r_o - r_o \cdot i_T$$

$$v_{gs2} = -i_T \cdot r_o (A + 1)$$



$$i_T = g_m (-i_T r_o (A + 1))$$

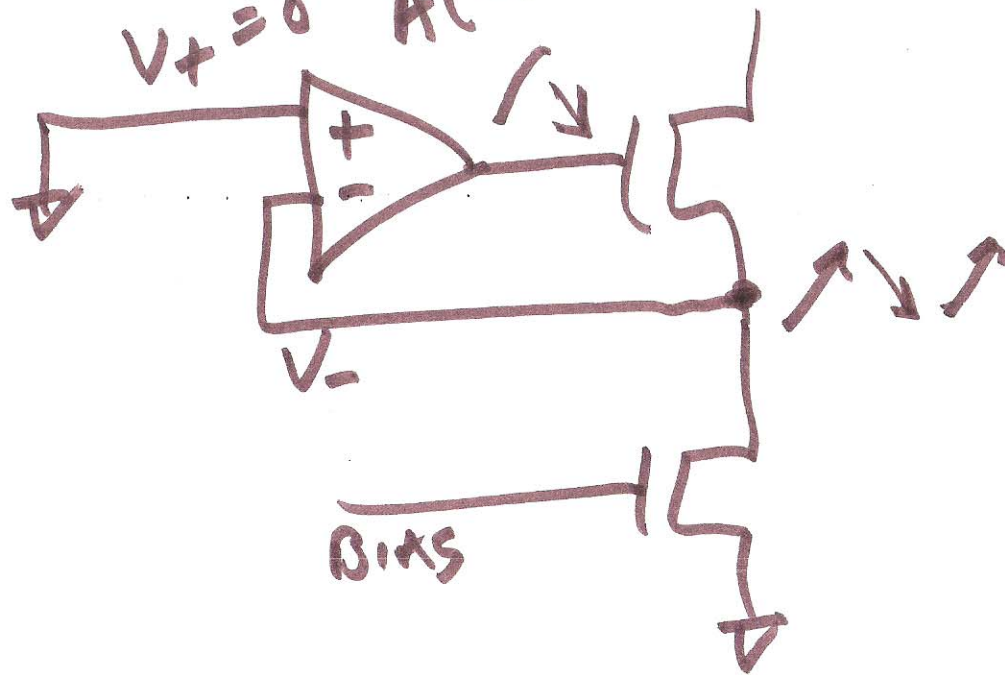
$$\frac{v_T - i_T r_o}{r_o}$$

4)

$$i_T (1 + g_m r_o (A+1) + 1) = v_T \cdot \frac{1}{r_o}$$

$$R_o \Big|_{\text{reg. cas.}} = \frac{v_T}{i_T} = r_o (2 + g_m r_o (A+1))$$

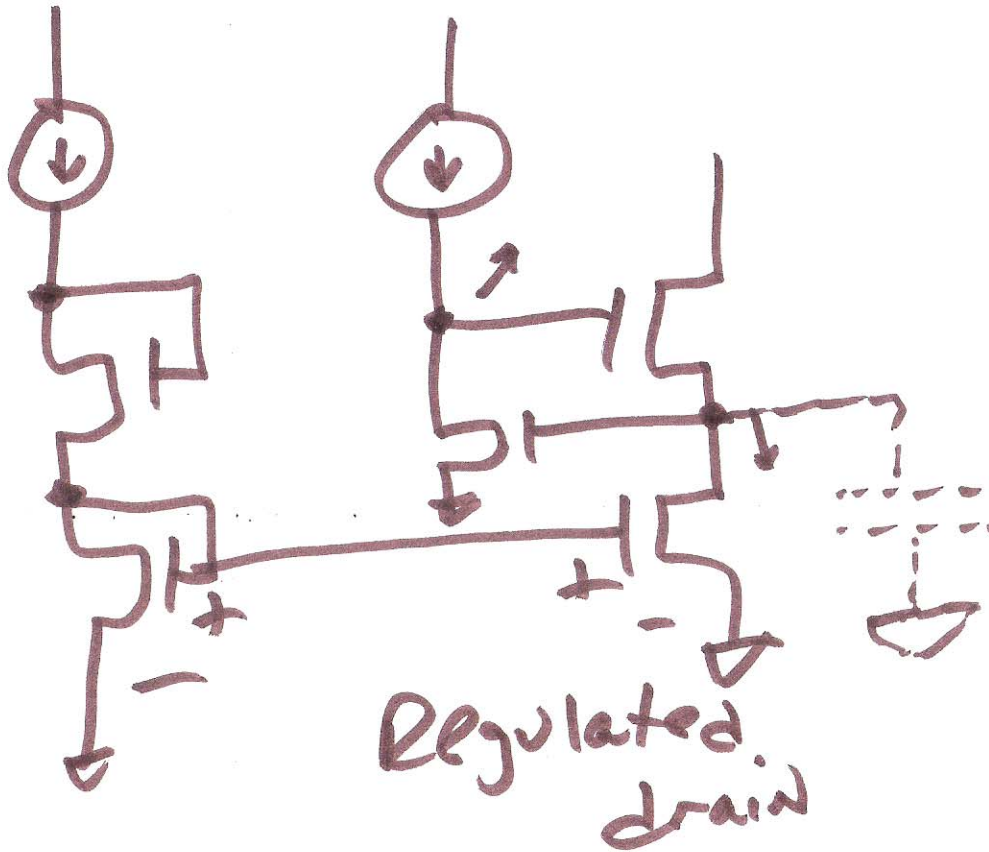
$$A(v_+ - v_-) \approx g_m r_o^2 (A+1)$$



very practical  
WAY to  
increase  
a current  
MIRROR  
OUTPUT  
RESISTANCE!

5)





$$I = C \frac{dv}{dt}$$

$$\frac{1 \text{ nA}}{1 \text{ pF}} \cdot 10 \text{ ns} = dv$$

$$\frac{10 \cdot 10^{-18}}{10^{-12}} = dv$$

$$10 \text{ mV}$$



6.7)