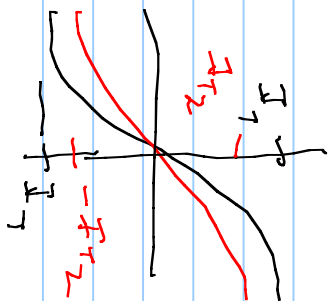
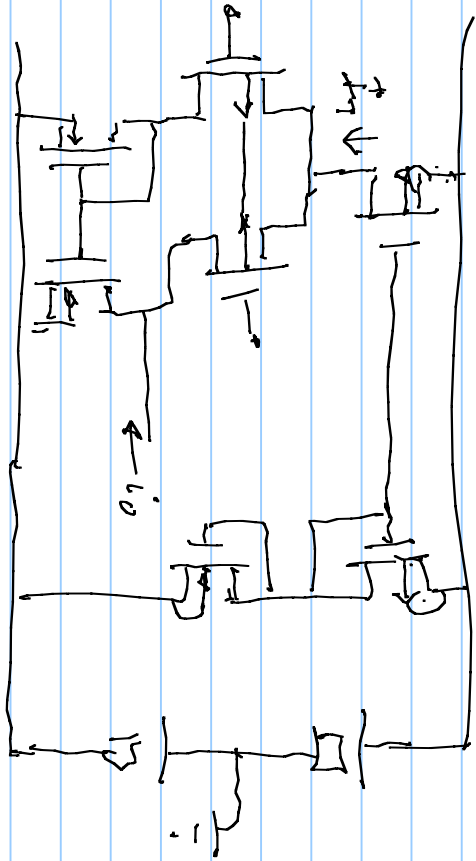


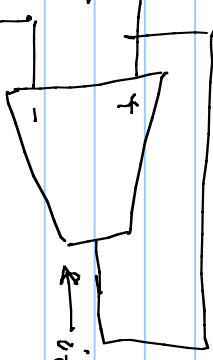
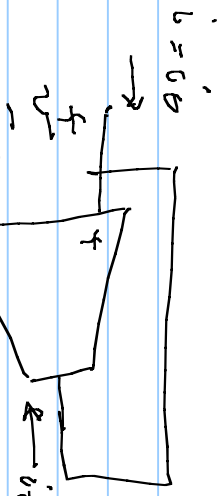
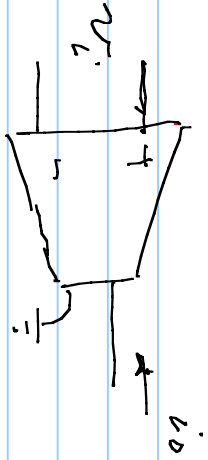
$$V_{GS1} - V_{GS2} = V_{th1} + \sqrt{\frac{I_1}{K}} - (V_{th2} + \sqrt{\frac{I_2}{K}}) \Rightarrow V_{th1} = V_{th2} \text{ cancel}$$

P.324, eq. (5.107) gives a formula for V_{th}

$$V_{th} = V_{T0} + \gamma \left(\sqrt{(2\phi_f + V_{SB})} - \sqrt{2\phi_f} \right) \Rightarrow V_{T0} \text{ if } V_{SB} = 0$$

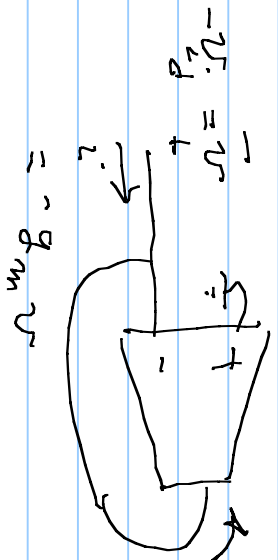
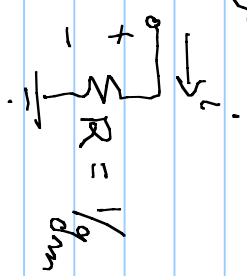
for PMOS differential pair





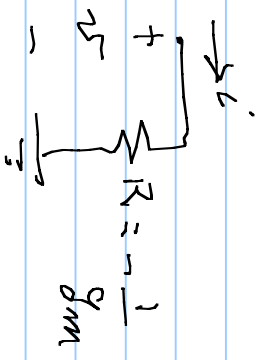
$i_D \approx g_m v_D$

\Rightarrow

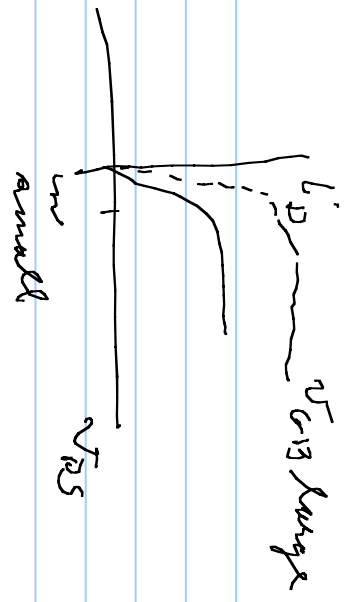
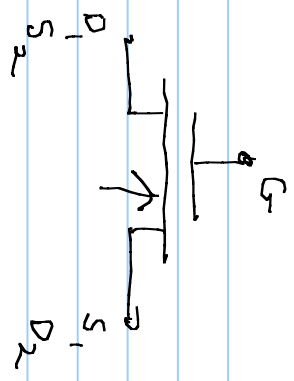


$i_D = -g_m v_D$

$R = 1/g_m$



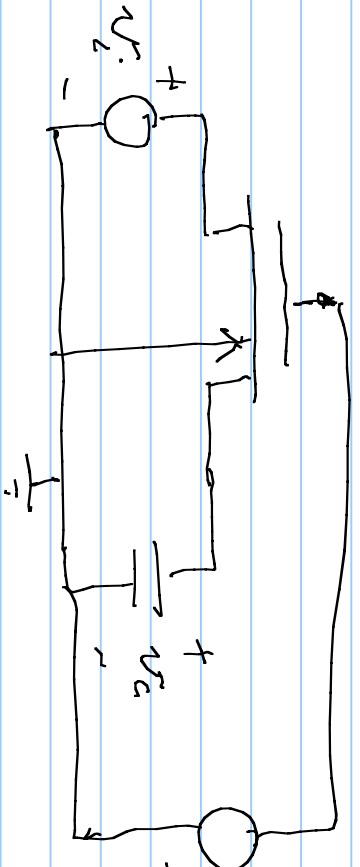
Pass Transistor



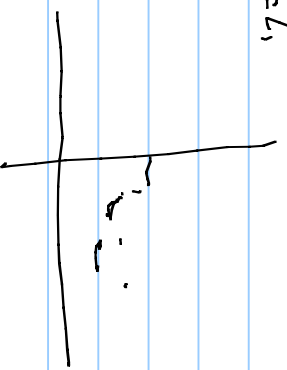
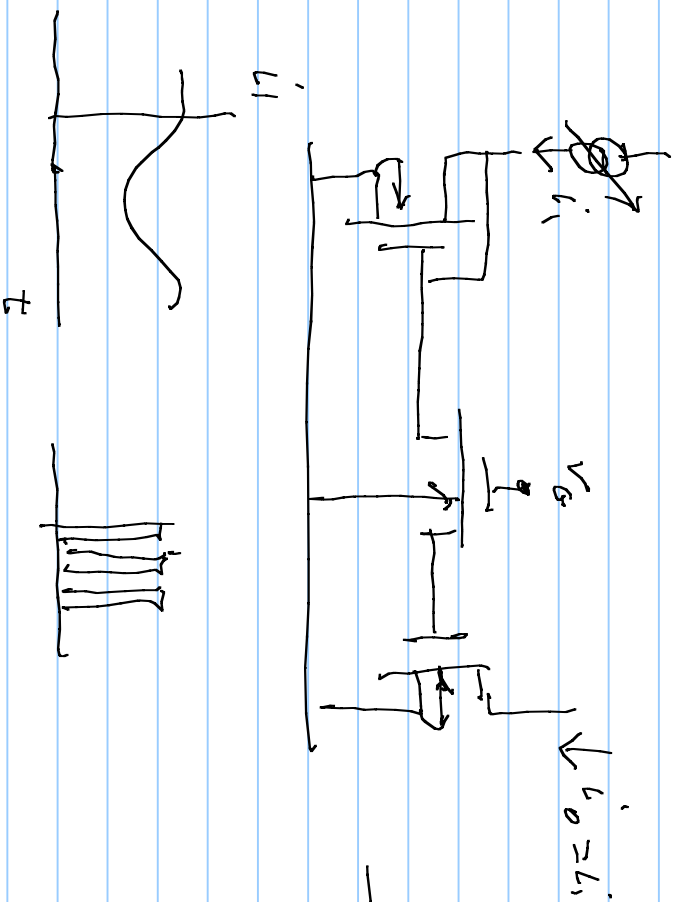
if $V_{DS} = \text{small}$

then $V_{D1} = V_{S1}$

& $V_{D2} = V_{S2}$



can switch off & on V_{G1}



sampled output

useful for digital filters
 if sample rate is
 above input highest
 frequency

