

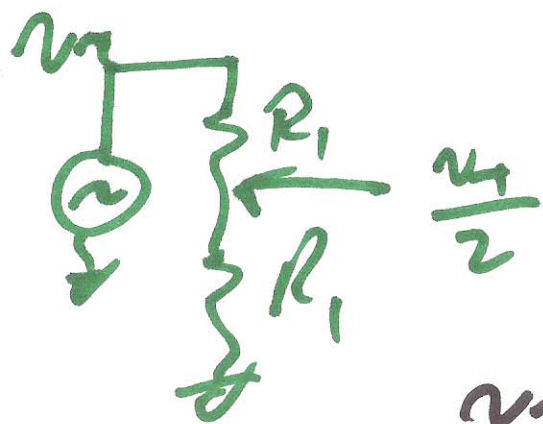
EE 420 / ECG 620

Lecture 12

Spring 2015

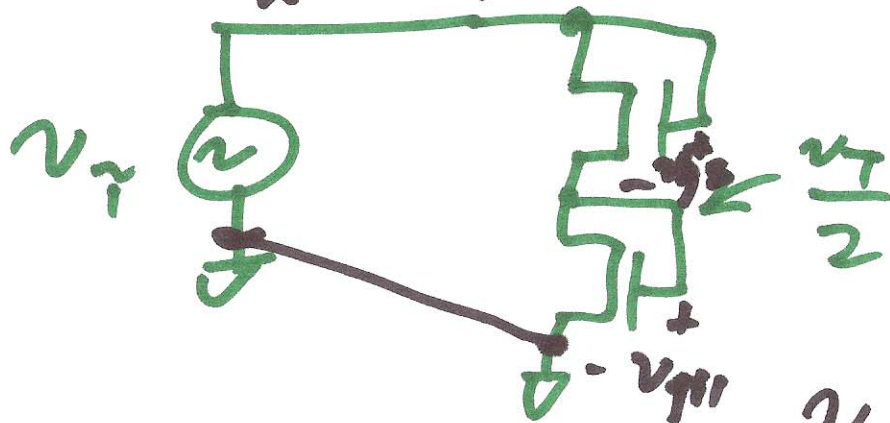
$$\frac{10}{2} \rightarrow 20\mu A$$

2/25/2015



$$R_{eq} = \frac{v_m}{i_T}$$

$$i_T = i_d$$



$$v_T = v_{gs} + v_{gs1}$$

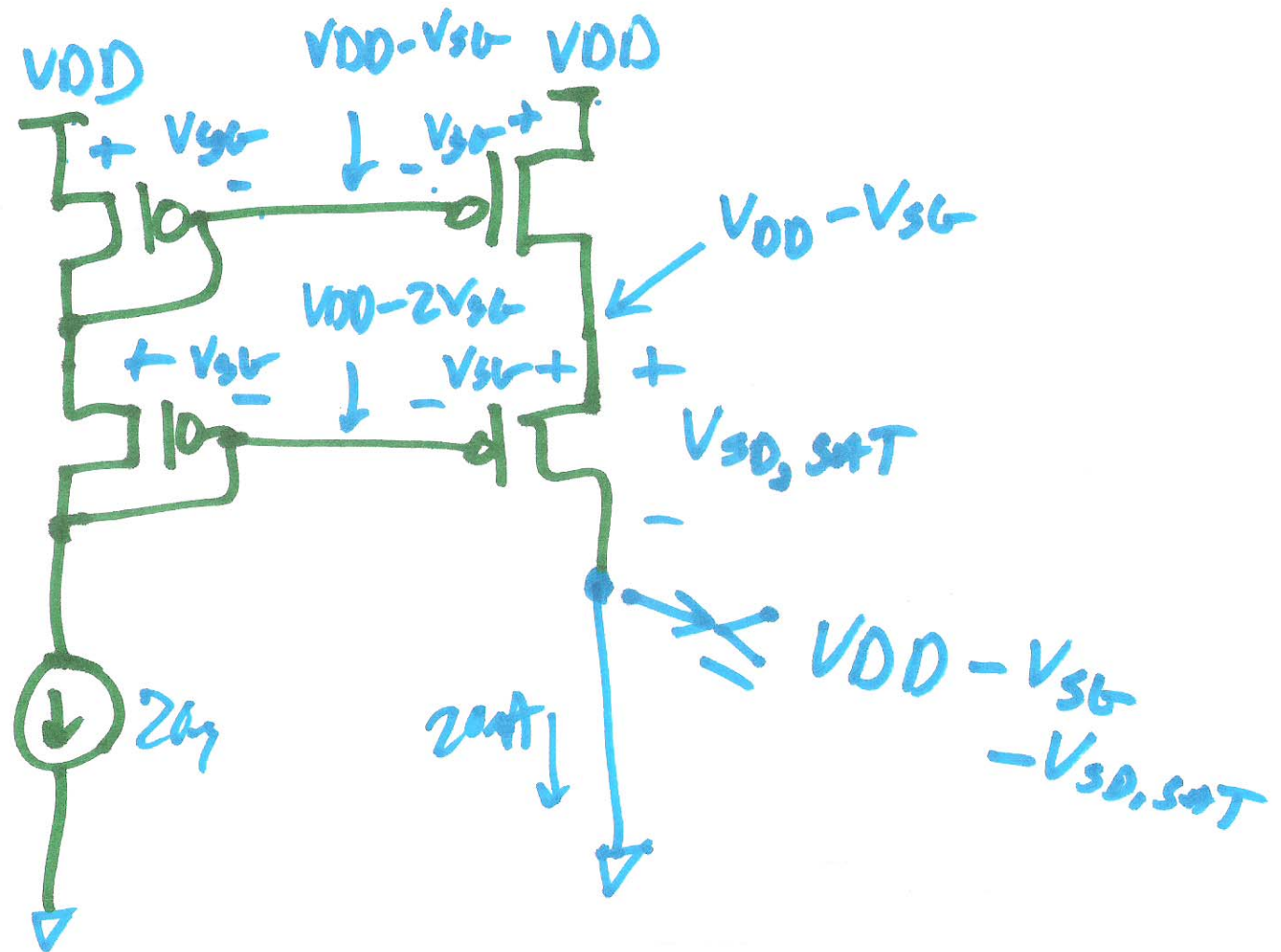
$$= \frac{i_d}{g_m} + \frac{i_d}{g_{m1}}$$

$$g_{m1} = g_m = g_{m0}$$

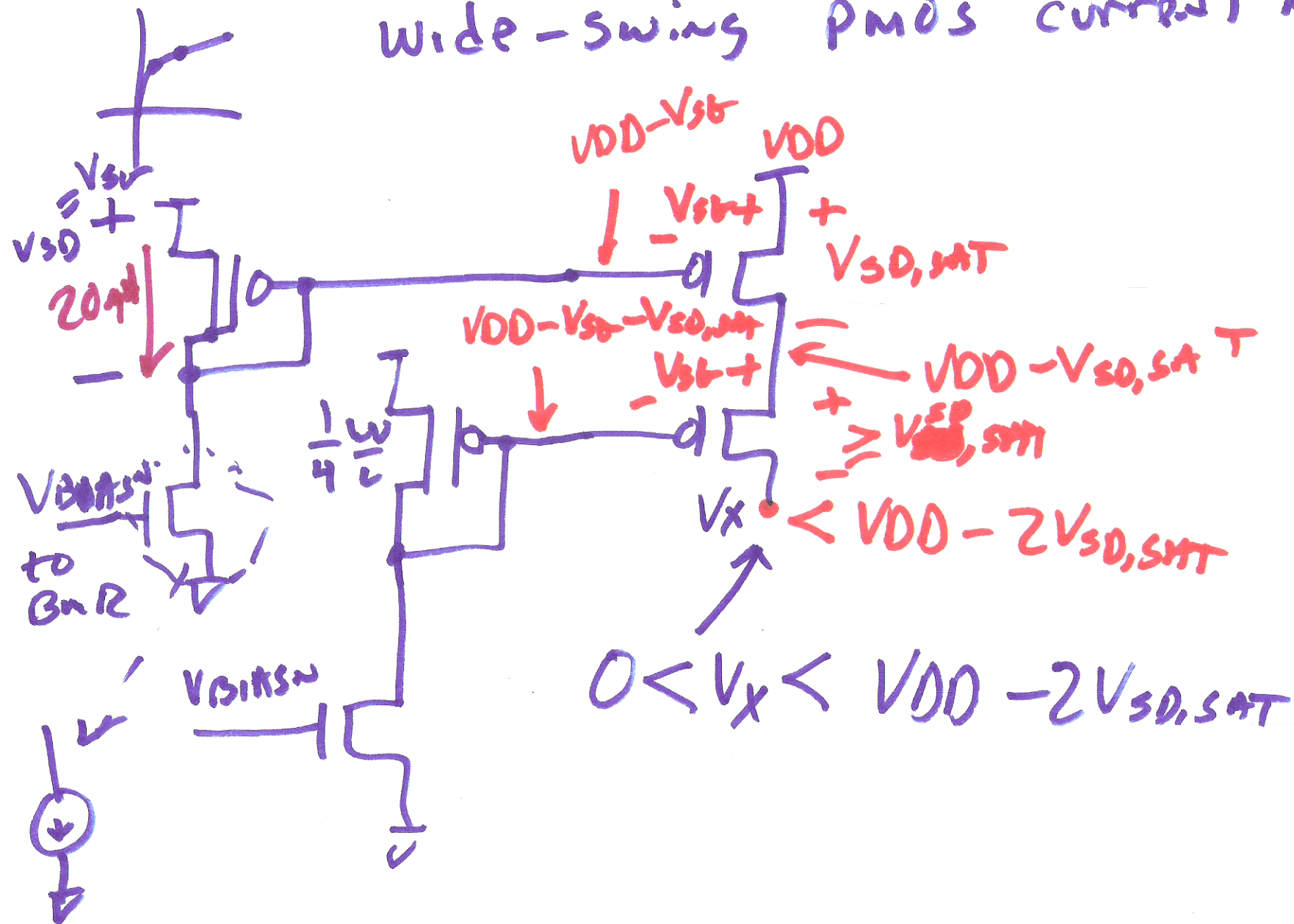
$$\frac{v_T}{i_T} = \frac{2}{g_m} = \underline{\underline{13K}}$$

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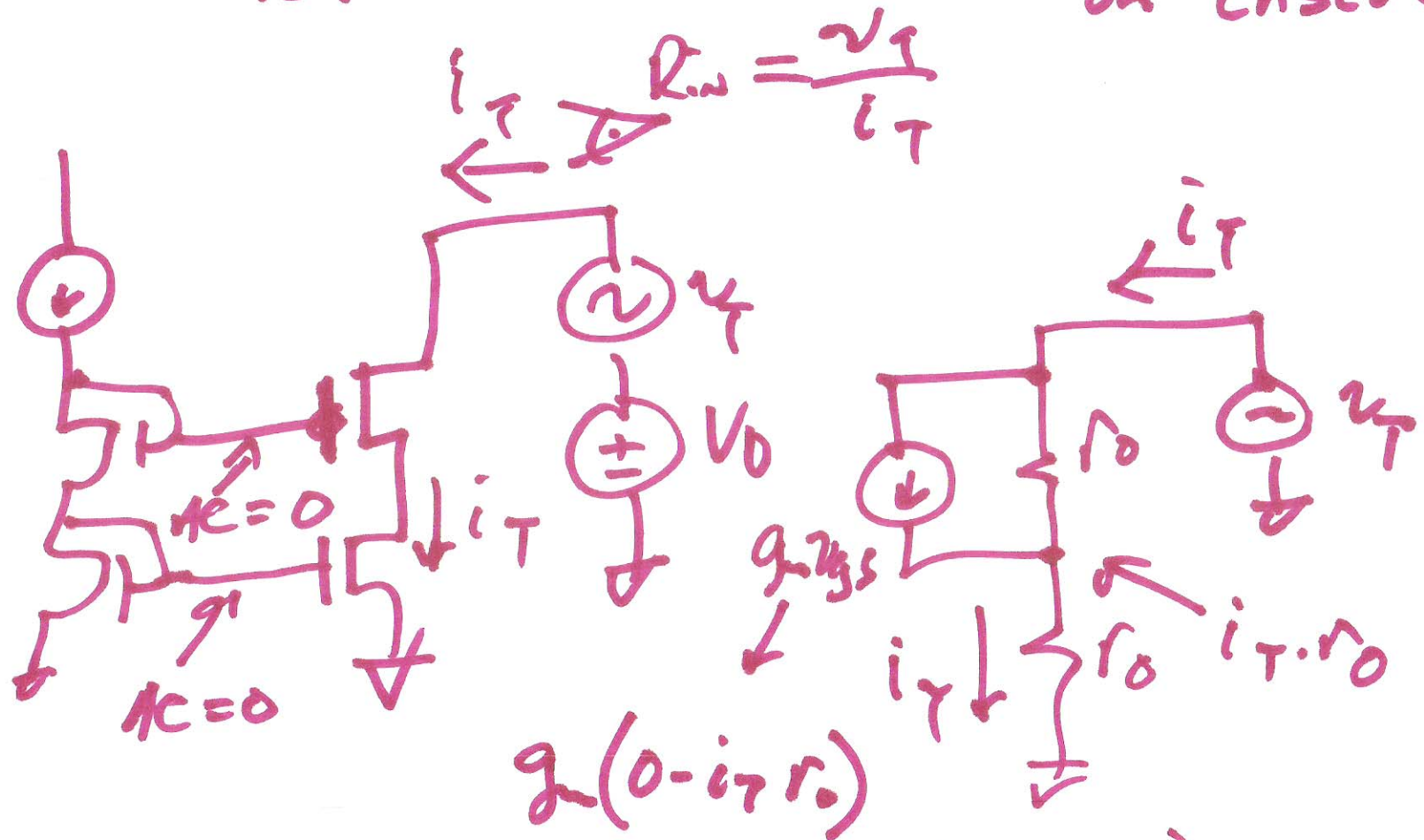
Basic CASCODE



wide-swing PMOS current mirror



Derive output impedance of cascode

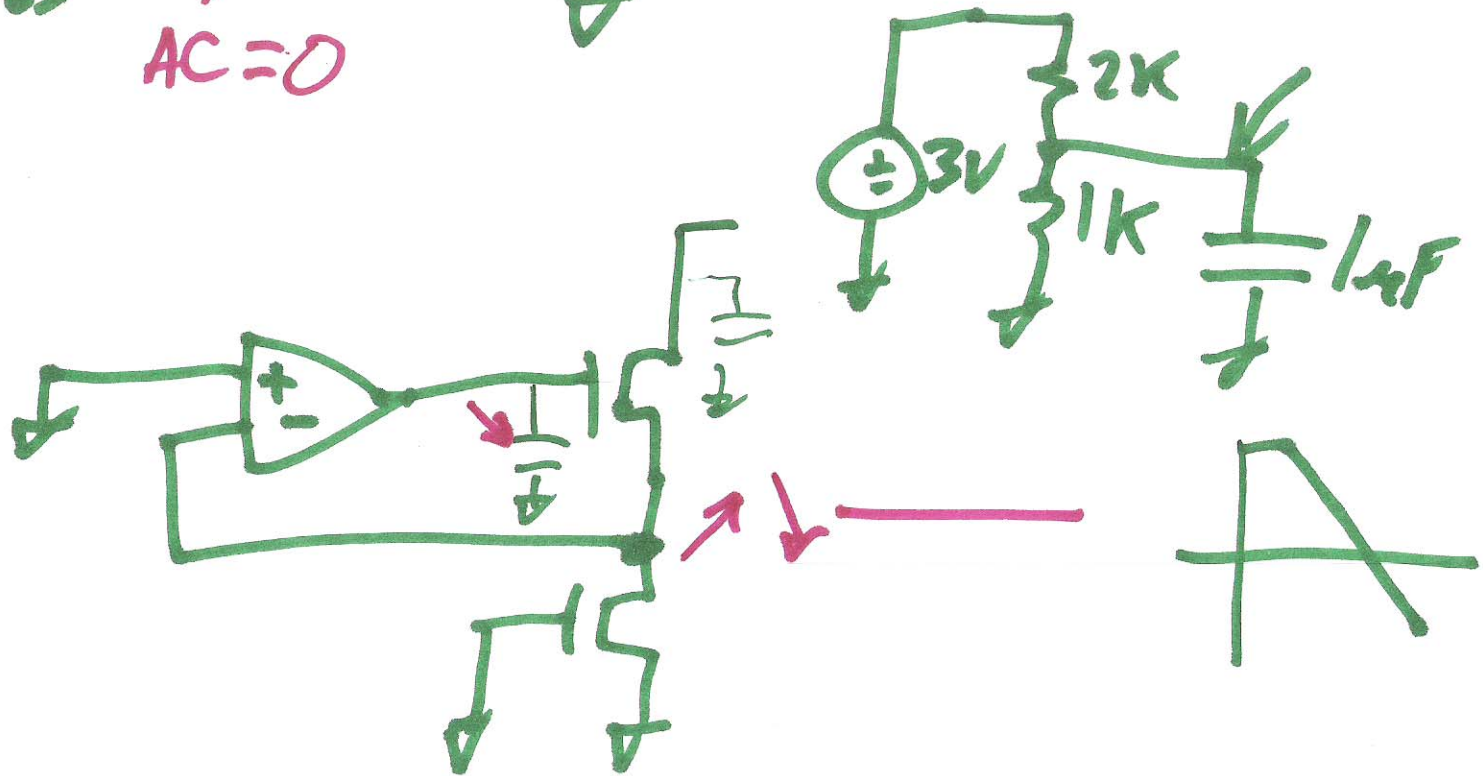
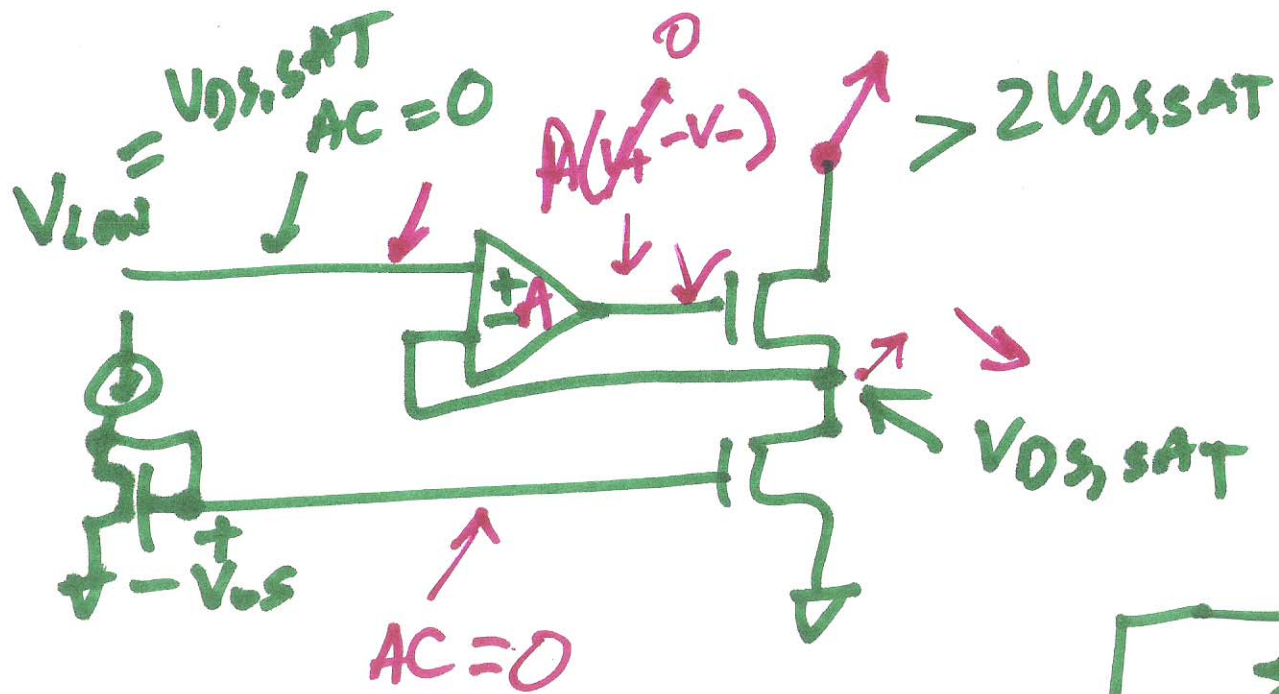


$$-g_m i_T r_o + \frac{v_T - (i_T r_o)}{r_o} = i_T$$

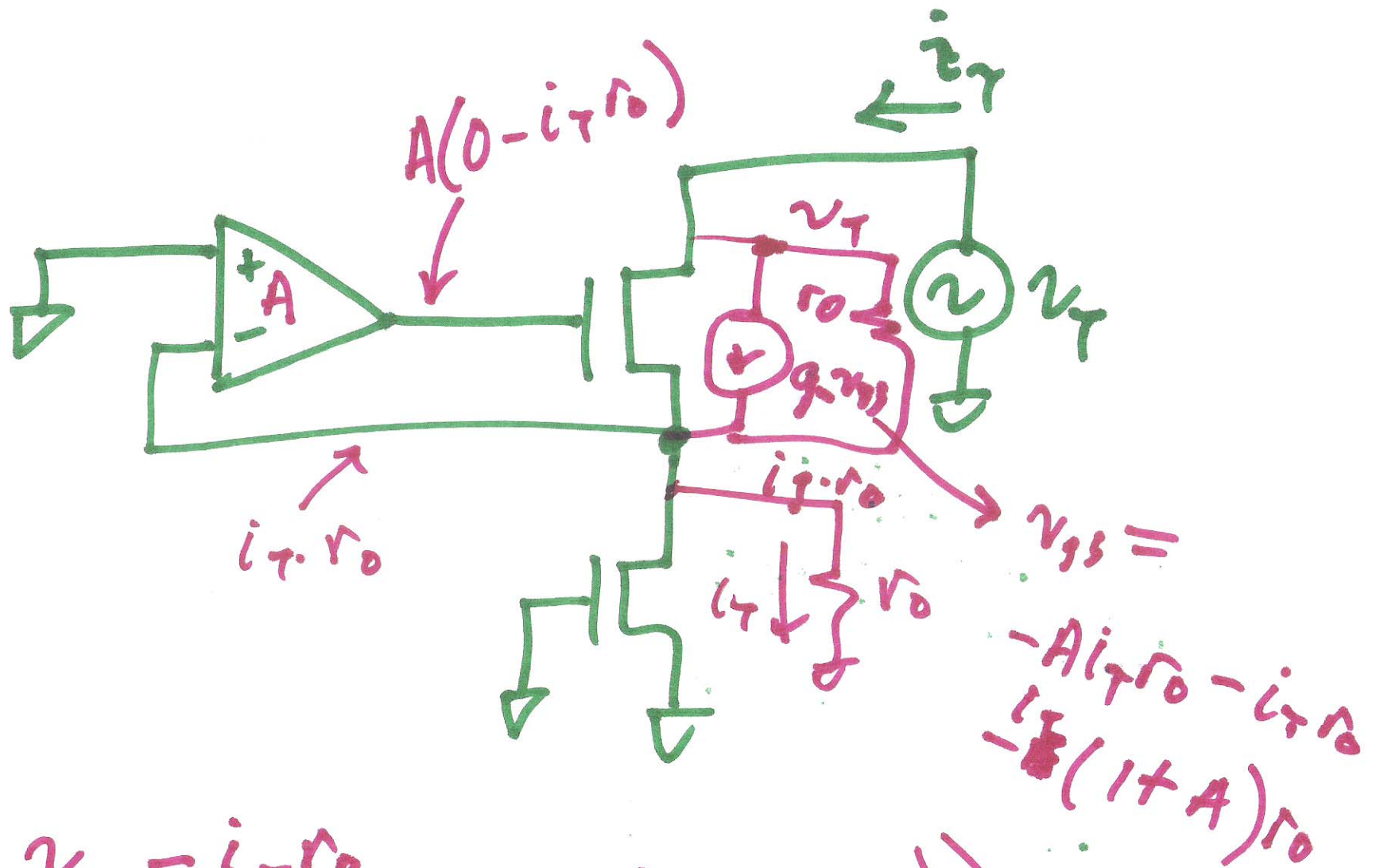
$$v_T = i_T r_o + g_m r_o^2 i_T + i_T r_o$$

$$\frac{v_T}{i_T} = g_m r_o^2 + 2r_o$$

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6)



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

$$i_T (r_o + r_o + g_m r_o^2 (1+A)) = v_T$$

$$R_{om} = \frac{v_T}{i_T} = 2r_o + g_m r_o^2 (1+A) \approx g_m r_o^2 A$$