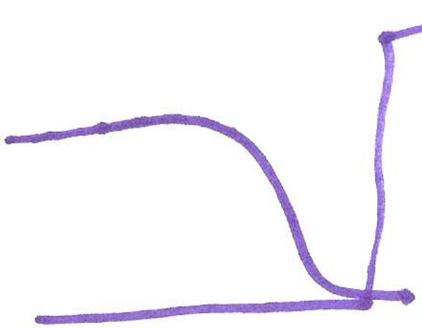


EE 420 / ECG 620

CMOS Analog IC Design

April 22, 2015

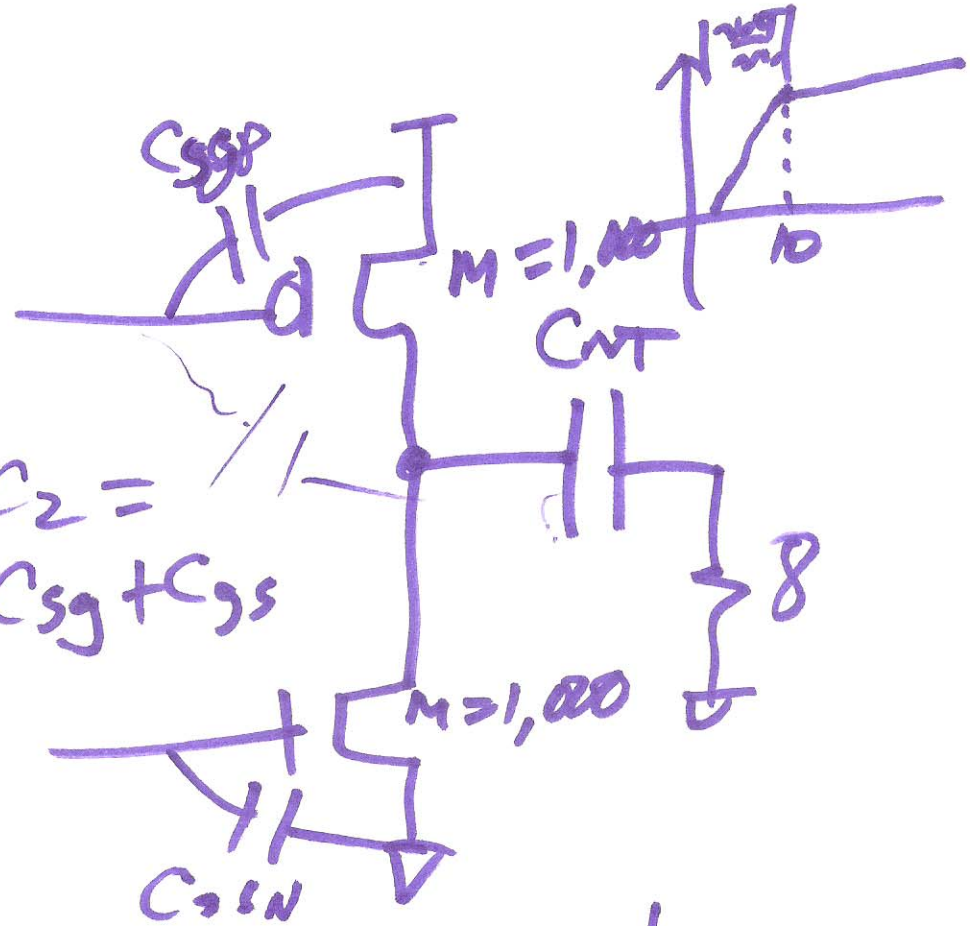
Lecture 25

$$C'_{ox} = \frac{\varepsilon_{ox}}{t_{ox}} = 3.9 \cdot 8.85\, aF/\mu m^2$$

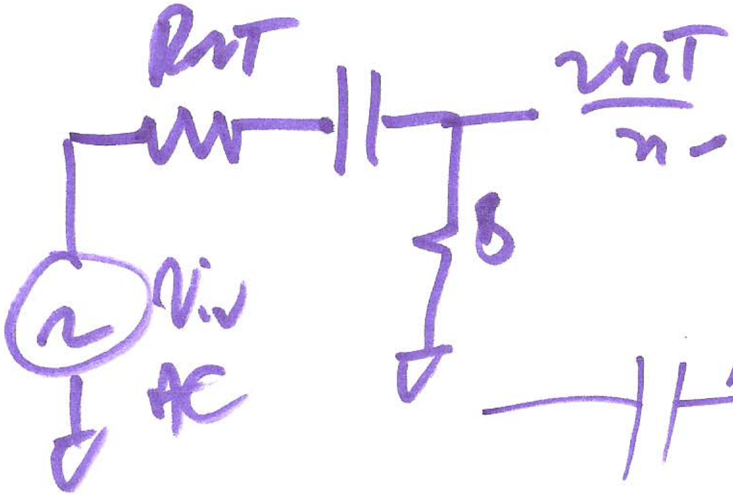
$$KP_n = \mu_n \cdot C'_{ox}$$

$$KP_p = \mu_p \cdot C'_{ox}$$

$$A_{OL} = g_{m1} \cdot R_1 \cdot g_{m2} \cdot R_2$$



$C_2 =$
$C_{sg} + C_{gs}$



$$f_{3dB} = \frac{1}{2\pi C_{out}(8 + R_{out})}$$

10

$R_{out} = 0$
worst
case

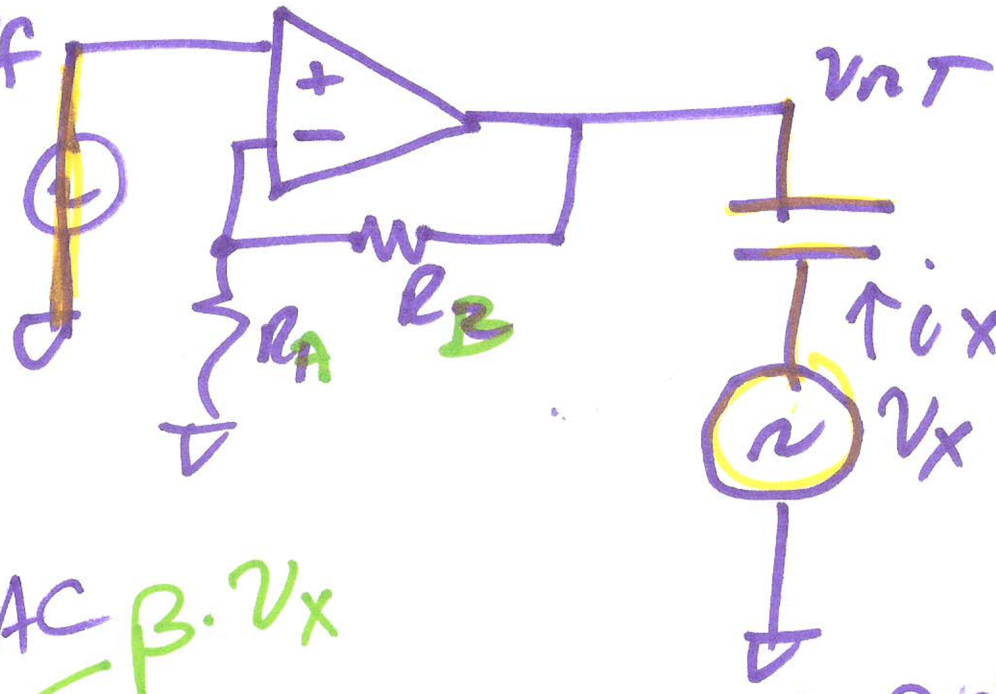
2)

$$\beta = \frac{R_A}{R_A + R_B}$$

$$A_{OL} = g_{m1} \cdot R_1 \cdot g_{m2} \cdot R_2$$

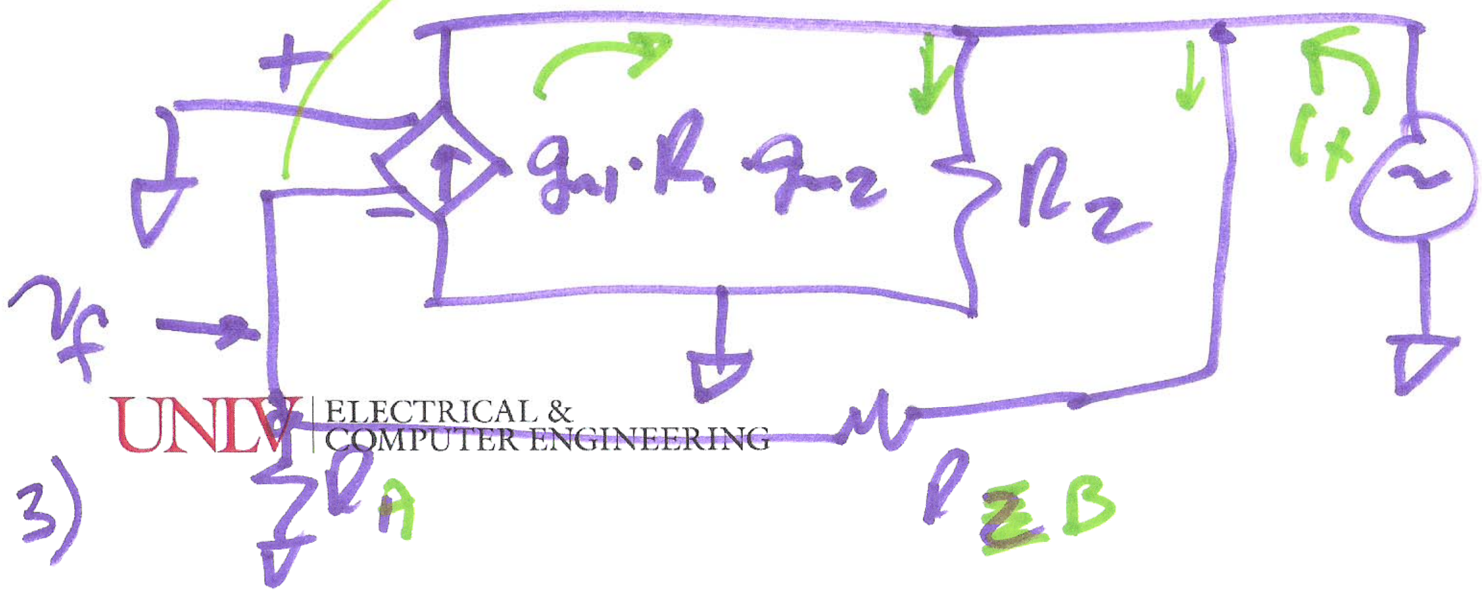
$\beta \cdot v_{OUT} = v_f$

$$R_{OUT} = \frac{v_x}{i_x}$$



AC $\beta \cdot v_x$

v_x $v_{OUT} = v_x$



$$R_{OUT} = \frac{v_x}{i_x}$$

3)

$$i_x + (0 - \beta v_x) g_{m1} \cdot R_1 g_{m2} = \frac{v_x}{R_2} + \frac{v_x}{R_A + R_B}$$

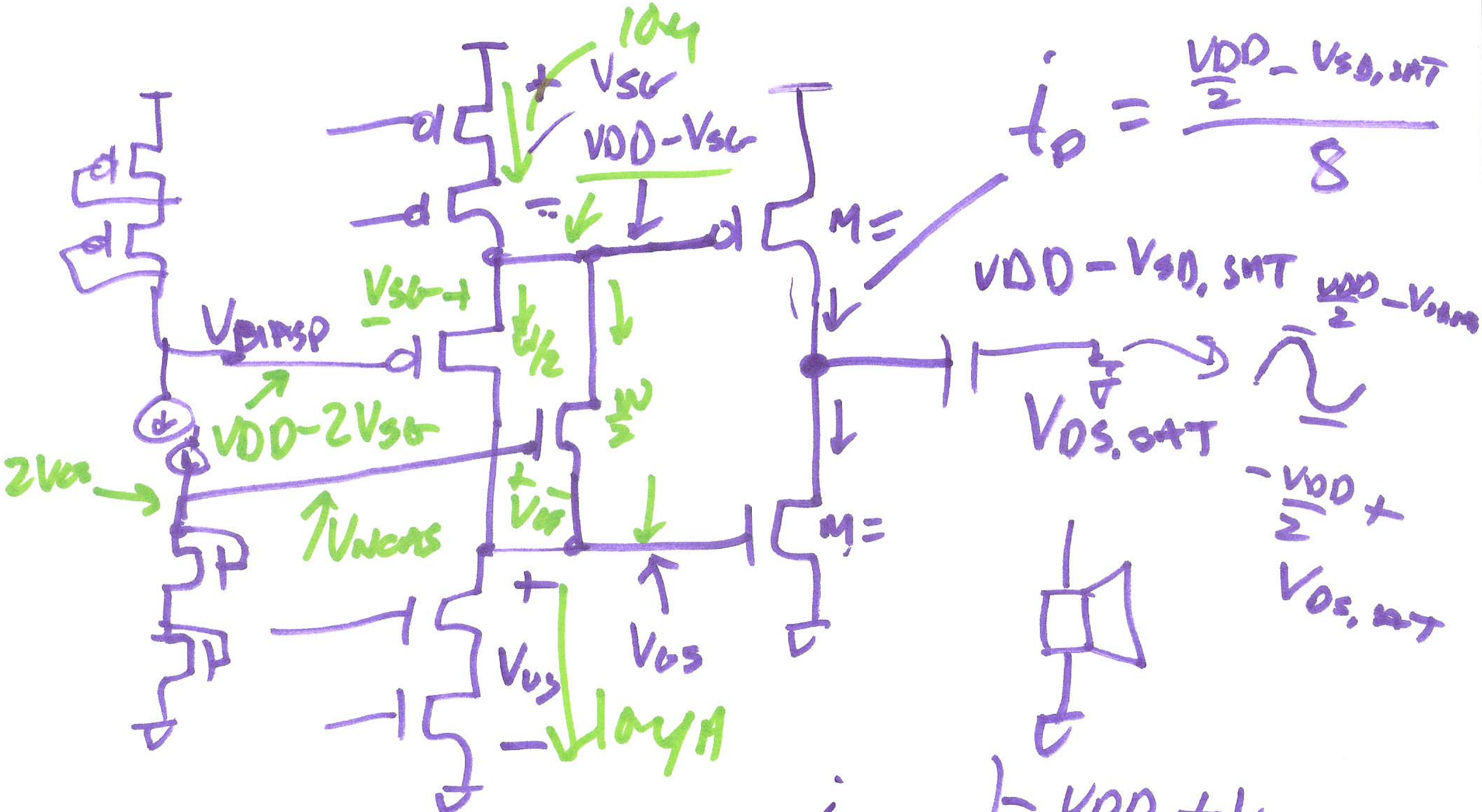
$$i_x = v_x \left(\beta g_{m1} R_1 g_{m2} + \frac{1}{R_2} + \frac{1}{R_A + R_B} \right)$$

$$R_2 i_x = v_x \left(\beta A_{OL} + 1 + \frac{R_2}{R_A + R_B} \right)$$

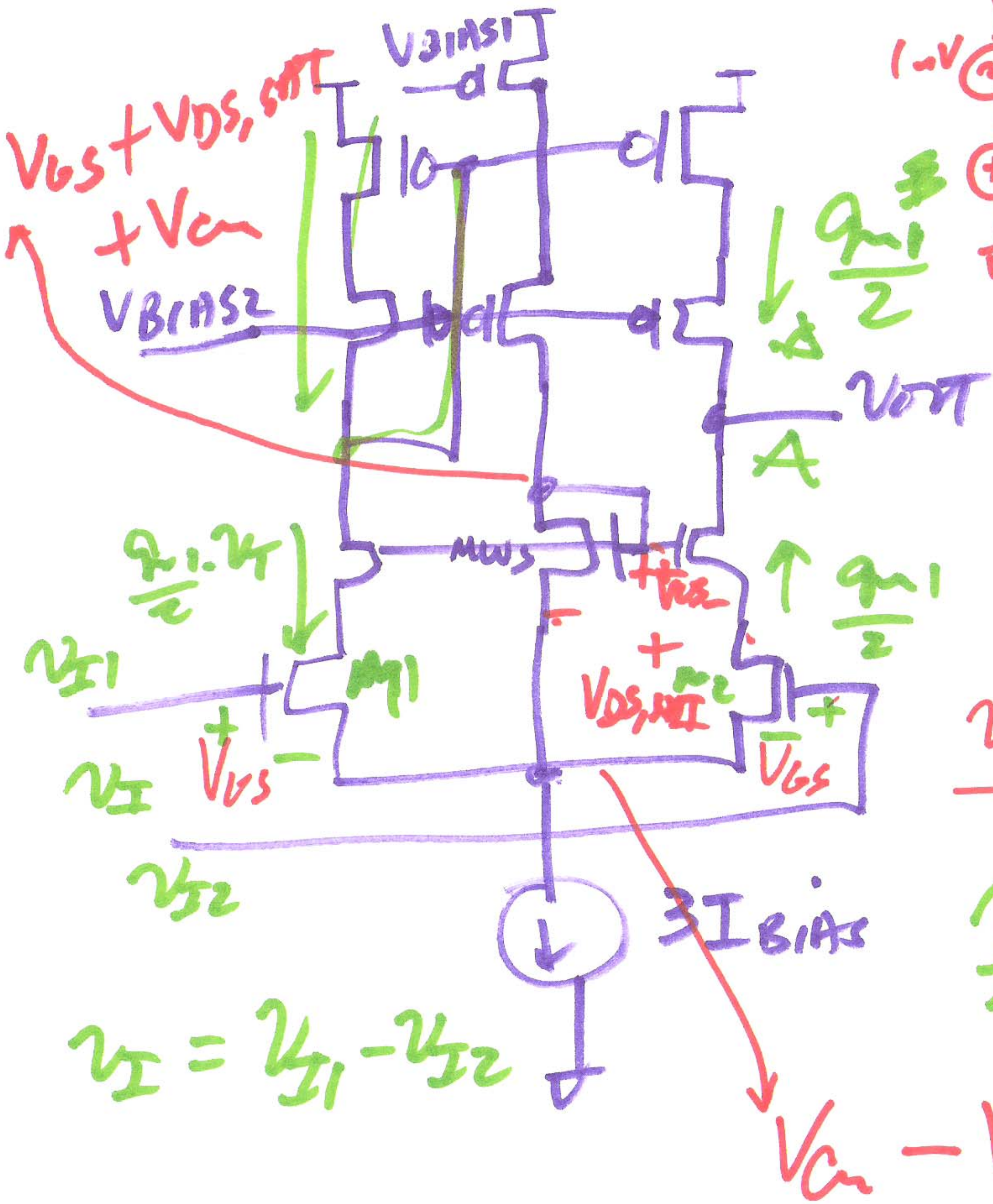
$$\frac{v_x}{i_x} = \frac{R_2}{1 + \beta A_{OL} + \frac{R_2}{R_A + R_B}}$$

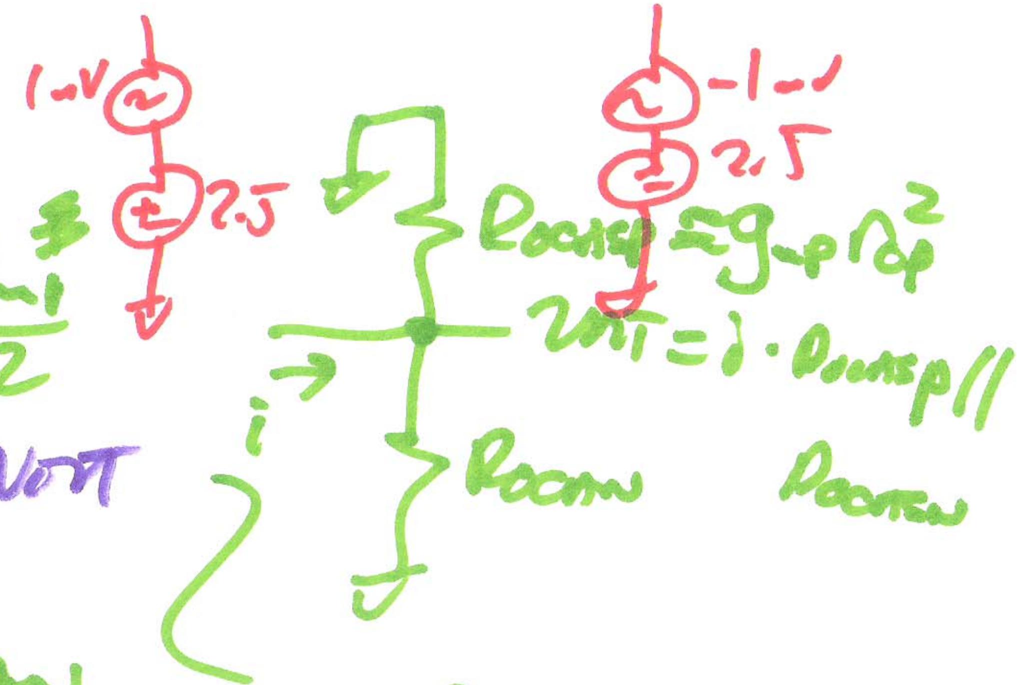
$$\approx \frac{1}{g_{m1} \cdot R_1 g_{m2}}$$

$$t_p = \frac{\frac{VDD}{2} - V_{SD,SAT}}{8}$$



$$i_n = \left| \frac{-\frac{VDD}{2} + V_{DS,SAT}}{8} \right|$$





$g_1 \cdot v_I = g_{m1} \cdot$

$\frac{v_{I1} + v_{I2}}{2} = V_{cm}$

$(v_{I1} - v_{I2})$

$\frac{v_{OUT}}{v_I} = g_{m1} R_{ocasn} \| R_{ocasp}$

$v_I = v_{I1} - v_{I2}$

$V_{cm} - V_{GS}$