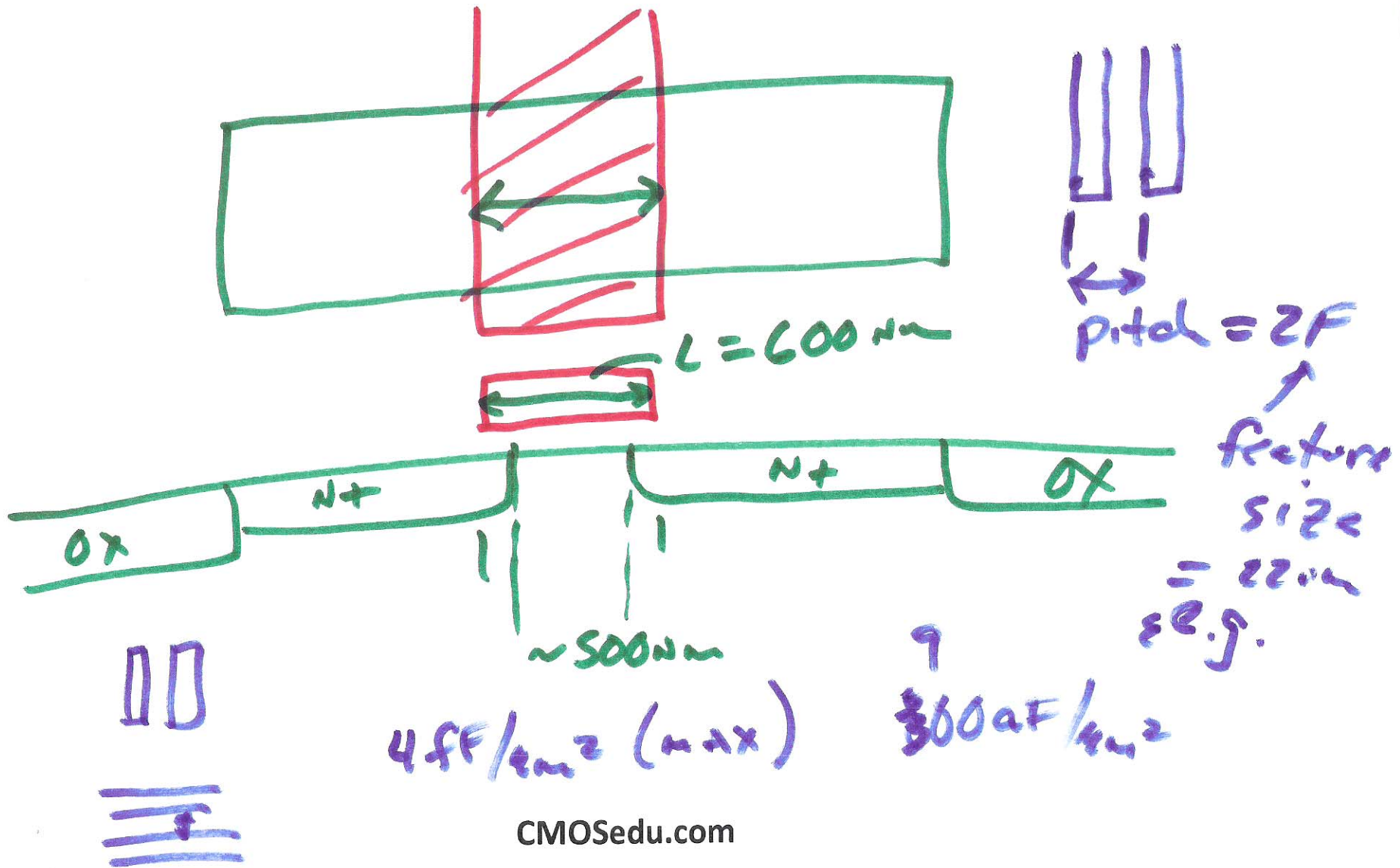


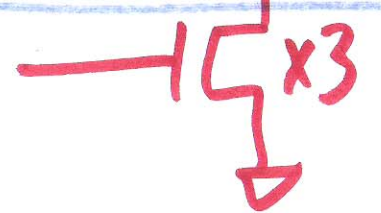
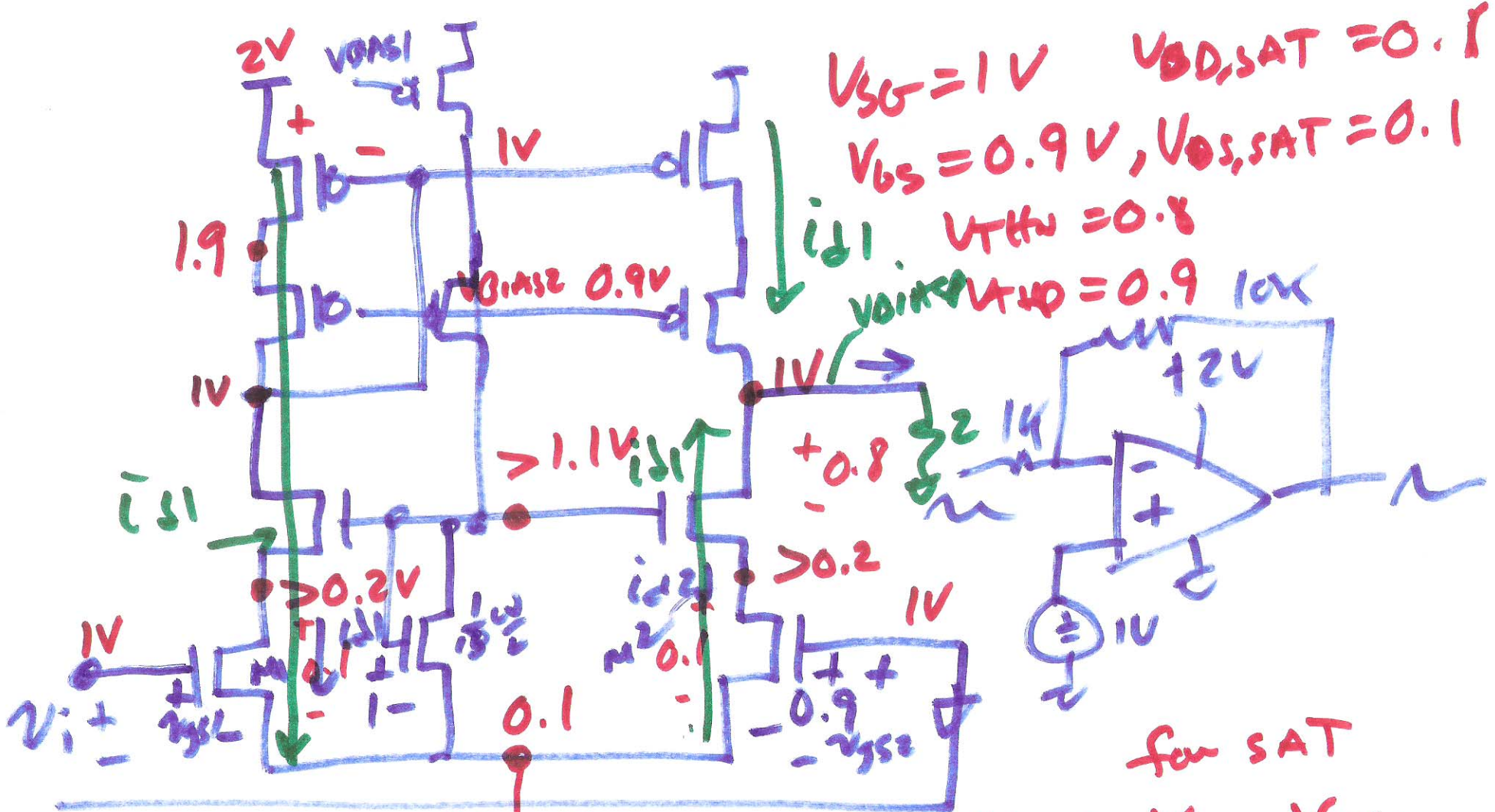
EE 422 ECG 622

Lecture 23

4/24/13



1)



for SAT

$$V_{DS} \geq V_{GS} - V_{THN}$$

$$V_{D1} - V_{SS} \geq \frac{V_{GS}}{1} - V_{SS} - \frac{V_{THN}}{0.8}$$

$g_m R_{out} \parallel R_{out} \geq 1$

2)

$$v_i = v_{gs1} - v_{gs2}$$

$$= \frac{i_{d1}}{g_m} - \frac{i_{d2}}{g_m}$$

$$i_{d1} = -i_{d2}$$

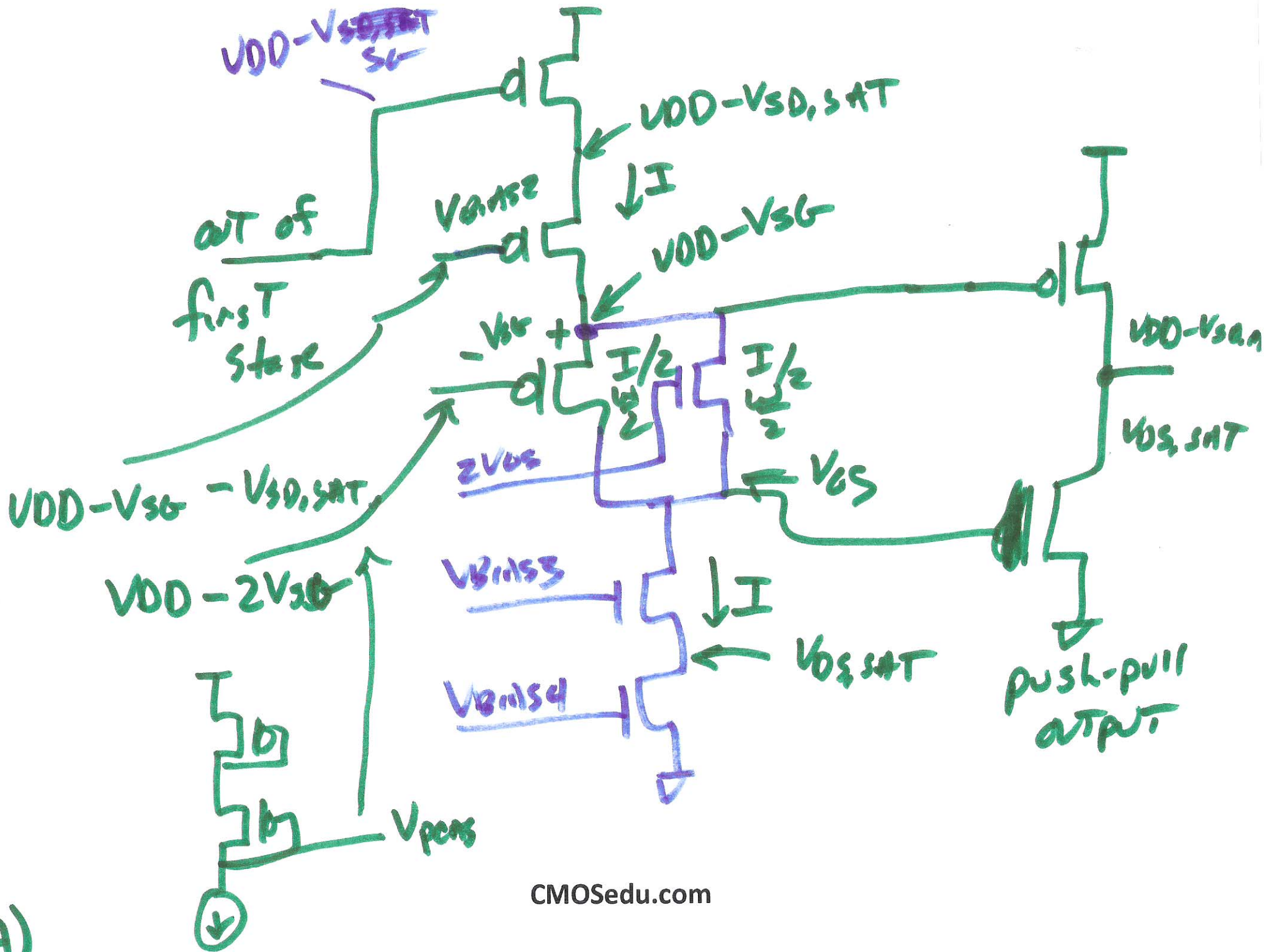
$$v_i = i_{d1} \cdot \frac{2}{g_m}$$

$$v_{out} = 2i_{d1} \cdot r$$

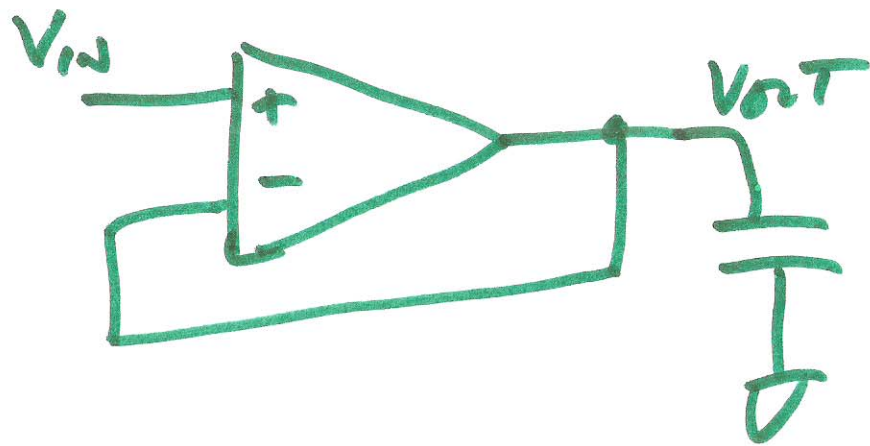
$$\frac{v_{out}}{v_{in}} = g_m \cdot r = g_m R_{out} \parallel R_{outSP}$$

$$g_m v_{gs} = i_{d2}$$

3)

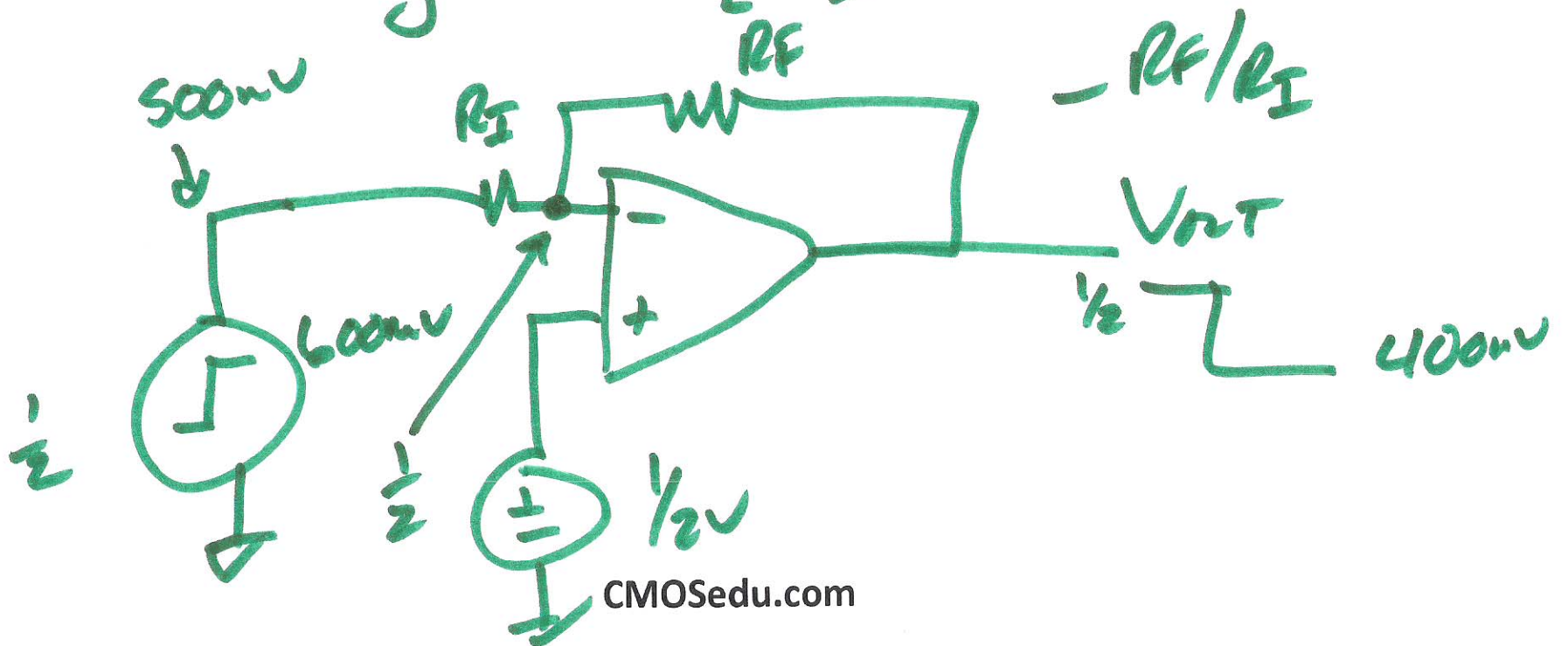


4)



$$V_{OV} = V_{OS, SAT}$$

$$g_m = K_P \cdot \frac{W}{L} (V_{GS} - V_{TH})$$

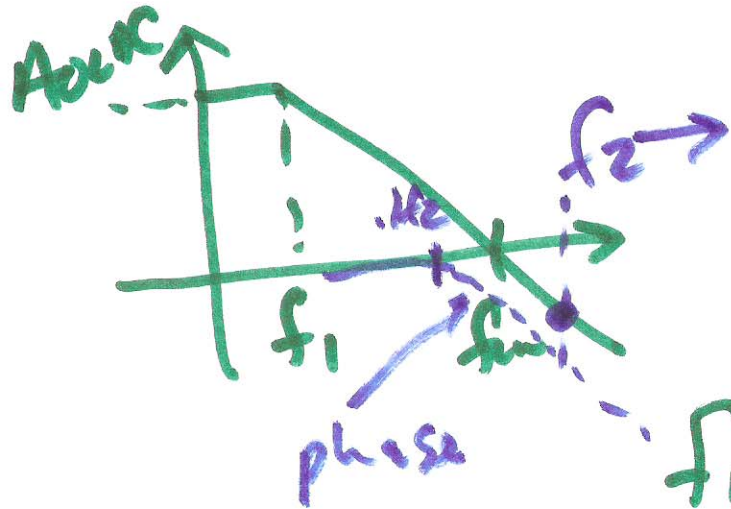


5)

$$f_{un} = \frac{g_{diff-pair}}{2\pi C_c}$$

$$f_T > 10 \cdot f_{un}$$

$$f_{un} \propto V_{ovn}$$



$f_1 \rightarrow$ lower 3dB freq

$$f_1 \cdot A_{OLoc} = f_{un} = \text{GAIN} \cdot \text{BW product.}$$

$$f_{un} \cdot 10 = f_2 \quad \text{for } 90^\circ \text{ PM}$$

$$f_2 \uparrow \quad g_{m2} \uparrow$$

6)