

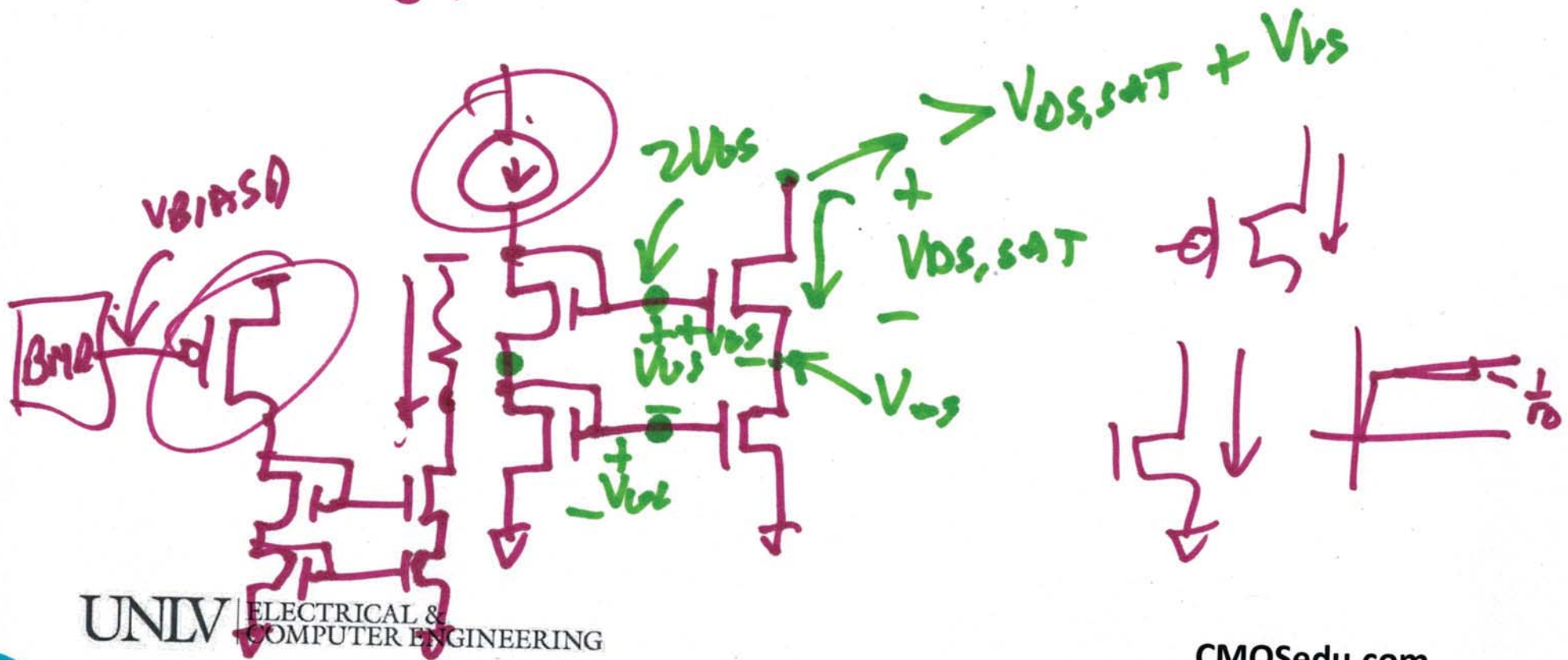
Lecture 12

EE 420 / ELG 620

Feb. 25, 2016



CASCODES



you didn't challenge me!

- $$\underline{5 - 2V_{os}} =$$



~~$$\frac{120 \mu A/kT}{2} \cdot \frac{10}{2} (V_{DS} - 0.8)$$~~

$$5 - 2V_{os} = 6(V_{os} - .8)$$

$$5 - 2V_{GS} = 6(V_{GS}^2 - 1.6V_{GS} + .64)$$

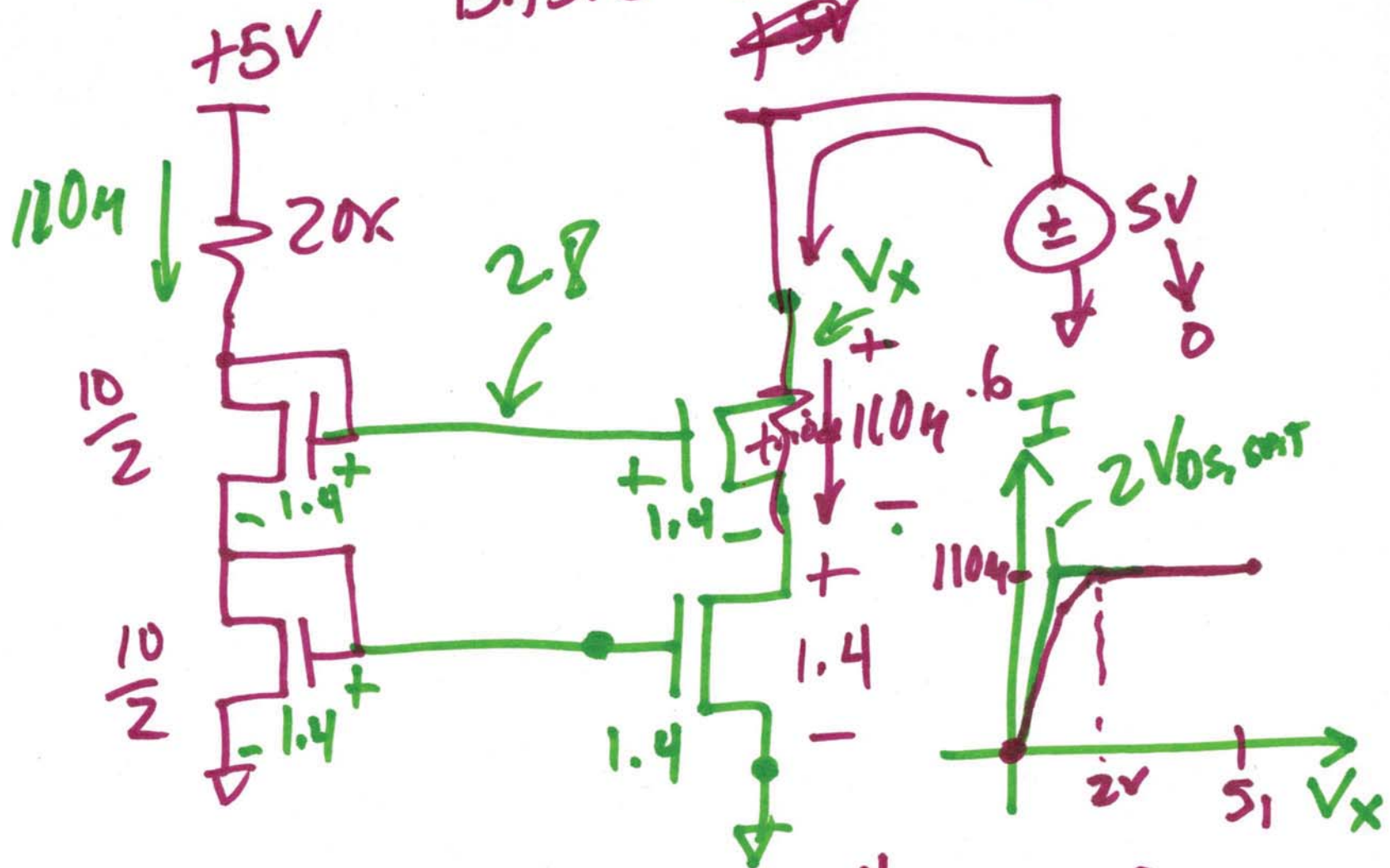
$$5 - 2V_{os} = 6V_{os}^2 - 9.6V_{os} + 3.84$$

$$0 = 6V_{bs}^2 - 7.6V_{bs} - 1.16$$

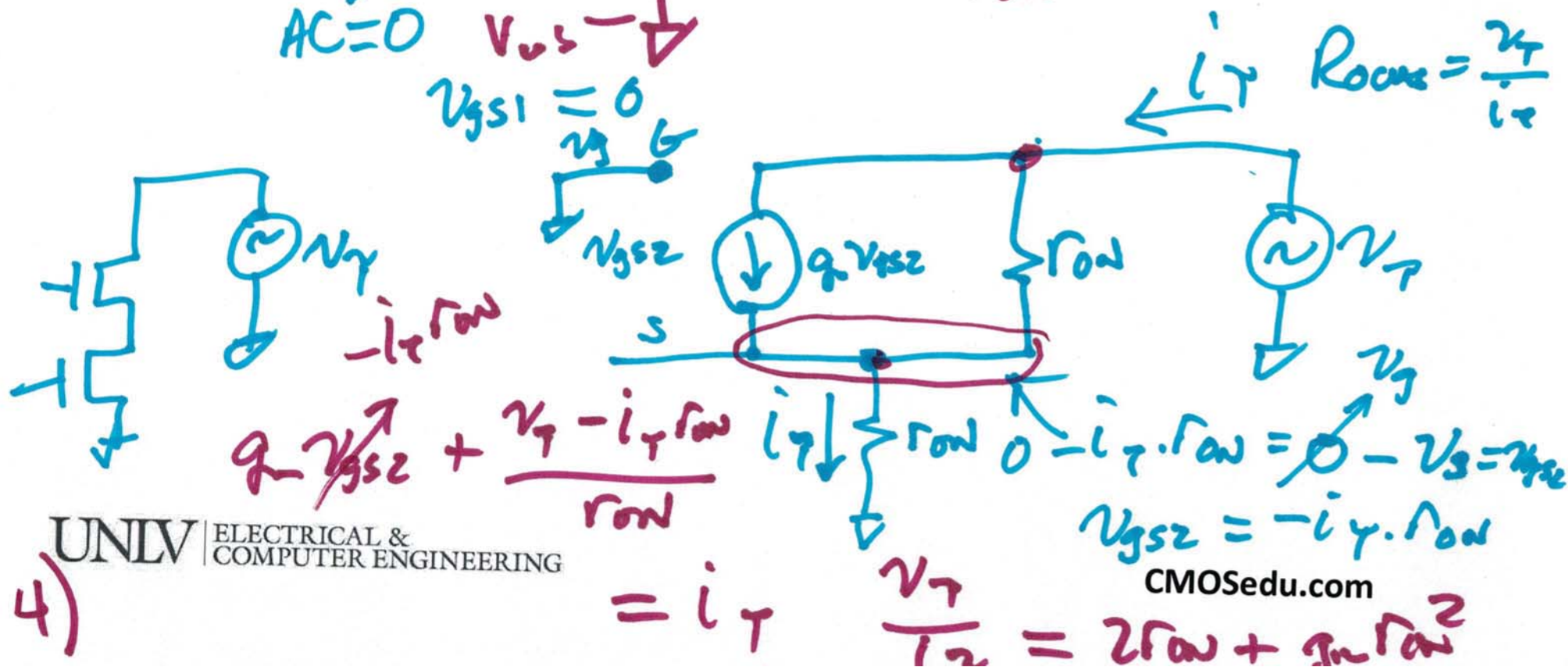
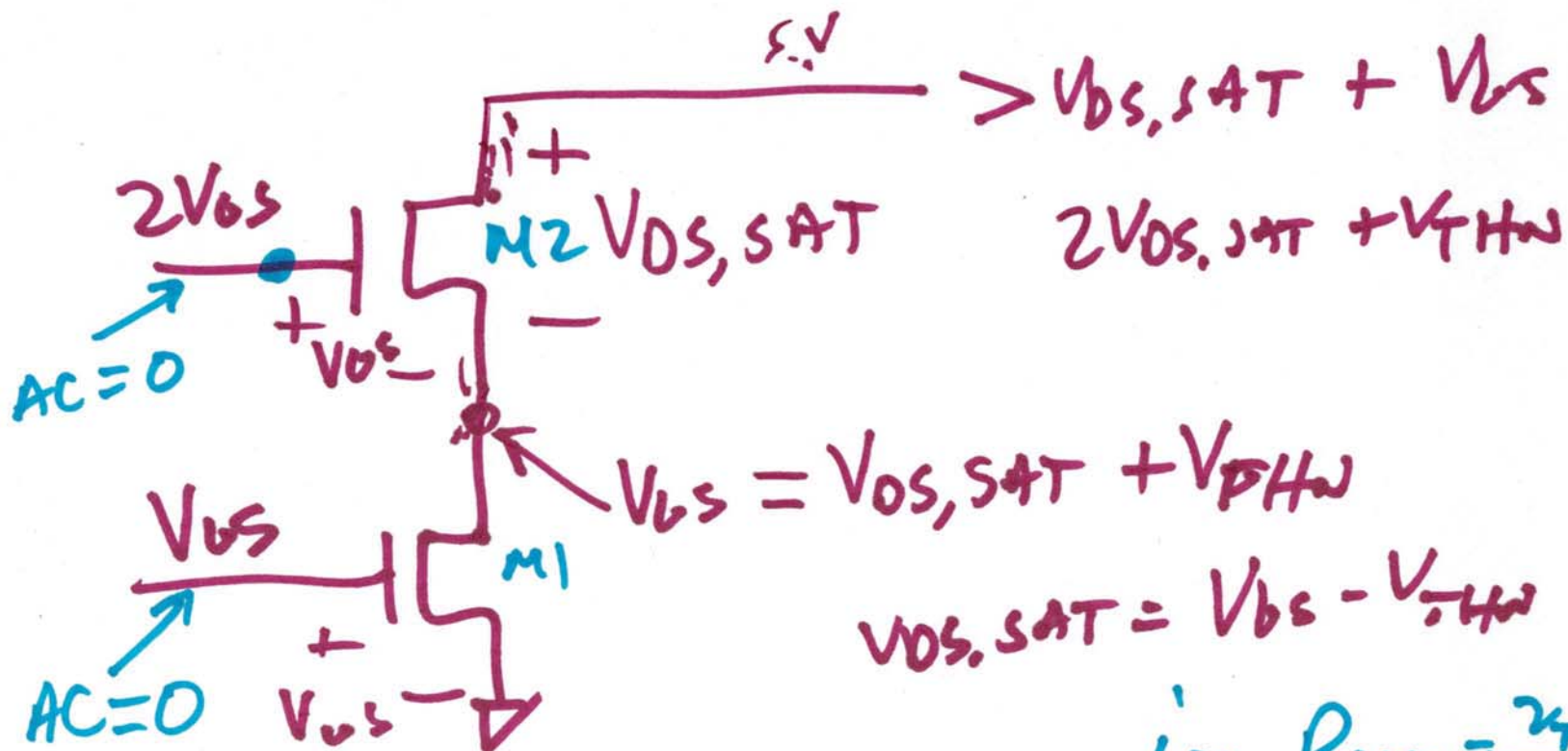
$$V_{GS} = \frac{7.6 \pm \sqrt{57.76 + 27.84}}{12} = \frac{7.6 \pm 9.25}{12}$$

$$I = \frac{5 - 2.8}{20k} = \frac{2.2}{20k} \quad \boxed{V_{GS} = 1.4V}$$

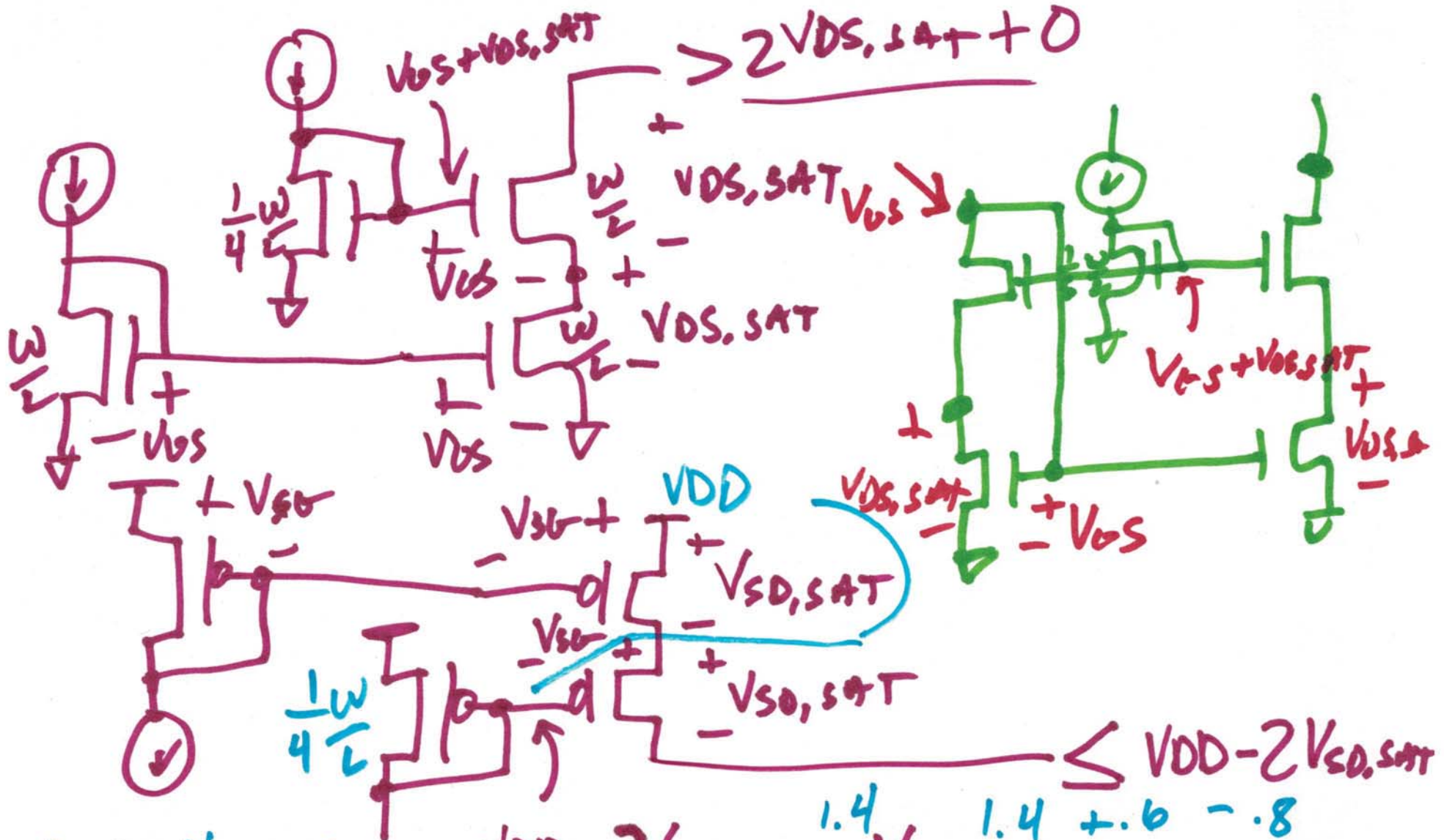
BASIC CASCODE



$$V_{DS,SAT} \geq V_{GS} - V_{THN} = .6$$



Wide-Swing cascode



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

$$V_{DD} - V_{SD, SAT} = V_{SG} = 1.4 + 0.6 - 0.8$$

$$V_{GS} \geq V_{GS} + V_{DS, SAT} - V_{THN}$$

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$$V_D - V_S \geq V_G - V_S - V_{THN} \rightarrow V_D \geq V_G - V_{THN}$$

