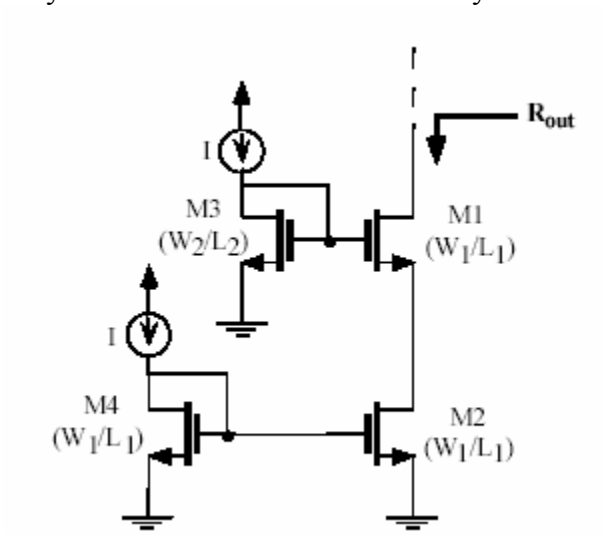
Problems with no solutions – Ch 4 (FETs part 1)

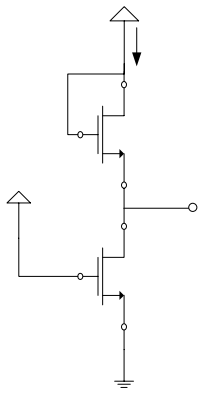
1.

Consider the following circuit. Neglecting Channel Length Modulation (CLM) and the Body Effect, calculate a relationship between W_1/L_1 and W_2/L_2 assuming that FETs M1 and M2 are biased exactly at the triode-saturation boundary.



2. (taken from midterm #2, 2003A)

For this question, you may neglect CLM and the Body Effect. All devices have $V_t = 2V$ and the same k_n', W and L.



For part a), assume that: $V_y = V_x$ and $V_{cc} = 8V$.

a) Calculate the value of V_x.

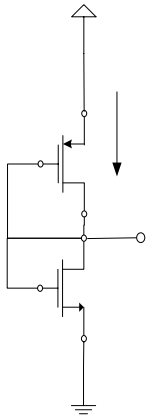
For parts b) and c), assume that $V_y = (V_x + 3)$.

b) If Vcc = 8 V**,** Calculate the value of $V_{x.}$

c) Assume V_{cc} is changed such that $V_x = 3V$. If $I_{M1} = 2mA$, what is the value of k_n'W/L for these transistors?

3. (based on problem 4.46 in text)

Consider the following circuits:



For this circuit, $k_n' = 2.5k_p' = 20\mu A/V^2$, $|V_t| = 1V$, $\lambda=0$, W/L = 3 and you may neglect the Body Effect.

Find the labeled currents + voltages.

+3

4. (from text, problem 4.41)

For this circuit, $V_t = 1V$, $k_n'=100\mu A/V^2$, $\lambda=0$ and $V_{DD}=Vi=5V$. Find the required W/L and R values so that $r_{DS} = 50\Omega$ and $V_o = 50mV$.