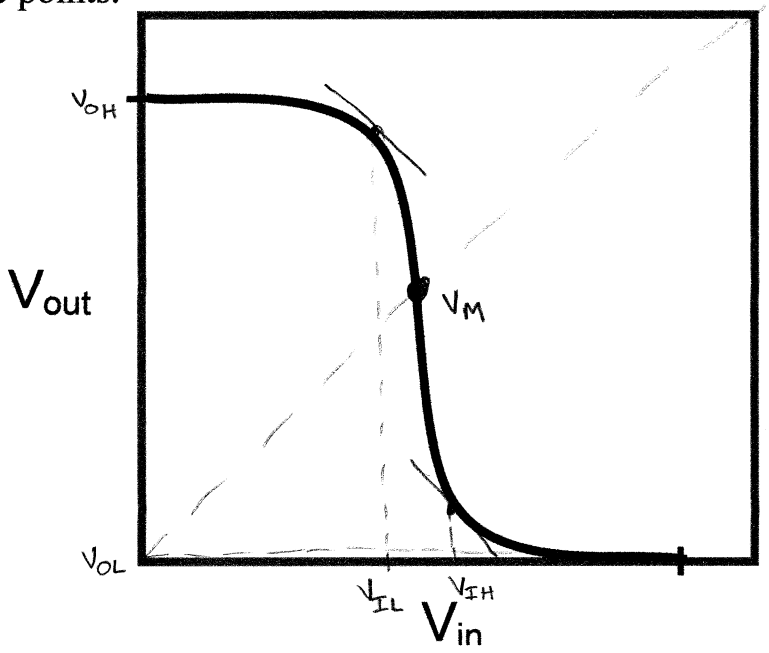
Quiz #1 **EEC118** **Spring 2011**

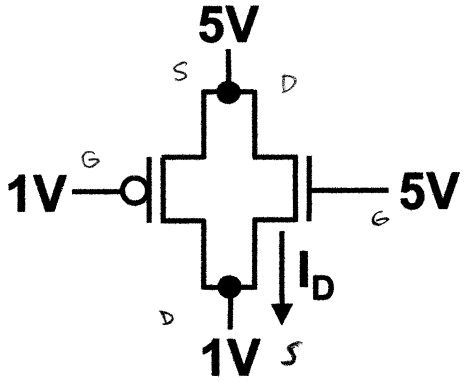
Name: Solutions Lab Section:____

Problem 1 (5 points) Label the following points on the Voltage Transfer Curve below: VOH, VOL, VIH, VIL, and VM. Indicate any other lines that are necessary to define the preceding voltage points.



(1 pt. each)

Problem 2 (5 points) For the following circuit, find the current I_D given: $W_n/L_n = W_p/L_p = 1$, $V_{T,n} = 1.1V$, $\mu_n C_{ox} = 300 \times 10^{-6} A/V^2$, $V_{T,p} = -0.9V$, $\mu_p C_{ox} = 100 \times 10^{-6} A/V^2$, $\lambda = 0$, $\gamma = 0$, $V_{DD} = 5V$. Show all work to receive full credit.



NMOS: $V_{GS} = 4V$, $V_{DS} = 4V > V_{GS} - V_T = 2.9V \Rightarrow$ sat.

$$I_N = \frac{\mu_n C_{ox}}{2}\left(\frac{W}{L}\right)_N (V_{GS} - V_T)^2$$

$$= \frac{300\,\mu A/V^2}{2}(1)_N(2.9)^2 = 1.262\,mA \quad (2\,pts.)$$

PMOS: $V_{GS} = -4V$, $V_{DS} = -4V < V_{GS} - V_T = -3.1V \Rightarrow$ sat.

$$I_P = \frac{\mu_p C_{ox}}{2}\left(\frac{W}{L}\right)_P (V_{GS} - V_T)^2$$

$$= \frac{100\,\mu A/V^2}{2}(1)(-3.1)^2 = 0.481\,mA \quad (2\,pts)$$

$$I_D = I_N + I_P$$

$$= \boxed{1.743\,mA} \quad 1\,pt.$$