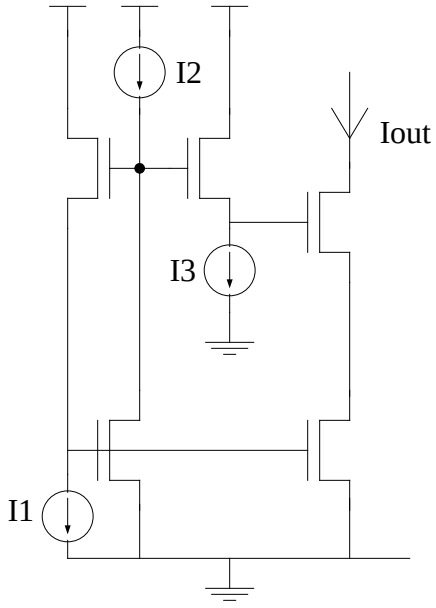
EEL 6935: HW#1

Due Friday, September 10, 2003 in class. Late homework loses $e^{\#\ of\ days\ late} - 1$ percentage points. See the current late penalty at http://www.cnel.ufl.edu/hybrid/harris/latepoints.html

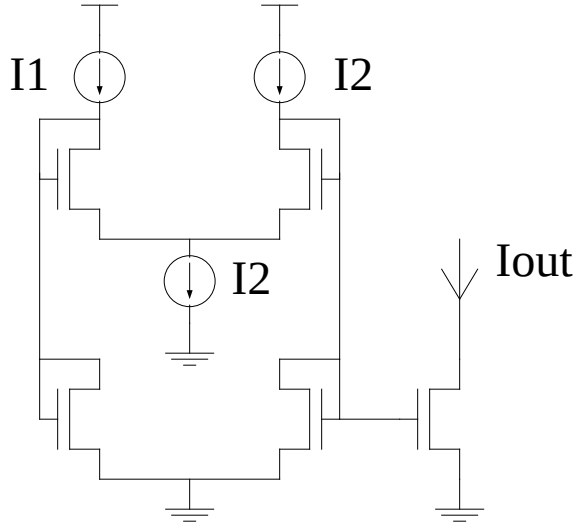
1. Suppose you make the following measurements on an NFET from a standard CMOS process. You set V_D to 5V and V_S to GND. For $V_G = 0.7V$, you measure $I_{DS} = 1$nA and for $V_G = 0.6V$ you measure $I_{DS} = 60$pA. Compute the constants I_0 and κ for this device. Assume $U_t = 25$mV and any other reasonable approximations. What V_G will be necessary to achieve exactly 100nA of current?

First each of the following circuit problems, solve the circuit in two ways: First, assume $\kappa = 1$ and derive your answer. Then assume κ is the same for all transistors but not equal to one and derive your answer. Show all of your work and explicitly state all assumptions, e.g. which transistors are in saturation, subthreshold operation, matching of devices, etc.

2. Solve for I_{out} as a function of I_1, I_2 and I_3.



3. Solve for I_{out} as a function of I_1 and I_2.



4. Solve for I_{out} as a function of I_1, I_2 and I_{in}.