EEL 6935: HW#1

Due Friday, September 10, 2003 in class. Late homework loses $c \#$ 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 $I_{DS} = 1nA$ and for $V_G = 0.6V$ you measure $I_{DS} = 60pA$. Compute the constants $I_0$ and $\kappa$ for this device. Assume $U_t = 25mV$ 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 $\kappa$ 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 $I_3$. 

\begin{center}
\includegraphics[width=0.5\textwidth]{circuit.png}
\end{center}

J.G. Harris August 29, 2002
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 $I_{in}$.