ECE 3050 Analog Electronics Quiz 7
October 7, 2009

Professor Leach Name______________________________

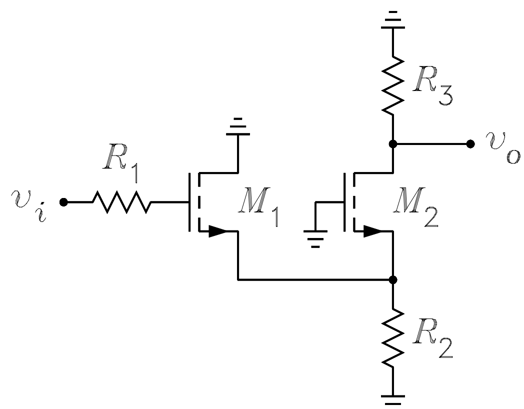
Instructions. Print your name in the space above. Place a box around your answers. Points will be subtracted if you do not express each numerical answer as a decimal number and if you do not put a box around answers. **Honor Code Statement:** *I have neither given nor received help on this quiz.* Initials __________

The diagram shows the ac signal circuit for a MOSFET amplifier. It is given that $R_1 = 100\,\mathrm{k\Omega}$, $R_2 = 1\,\mathrm{k\Omega}$, $R_3 = 30\,\mathrm{k\Omega}$, $K = 0.4\,\mathrm{mS}$, $V_{TO} = 1.5\,\mathrm{V}$, $I_D = 2.5\,\mathrm{mV}$, $i_D = K\left(v_{GS} - V_{TO}\right)^2$, $r_0 = \infty$, $g_m = 2\sqrt{KI_D}$, and $r_s = g_m^{-1}$.

(a) Solve for the small-signal voltage gain $A_v = v_o/v_i$.

(b) Solve for the input resistance looking into the v_i node.

(c) Solve for the output resistance looking into the v_o node.



$$A_v = \frac{i'_{s1}}{v_i} \times \frac{i'_{s2}}{i'_{s1}} \times \frac{i'_{d2}}{i'_{s2}} \times \frac{v_o}{i'_{d2}} = \frac{1}{r'_{s1} + r'_{s2} \| R_2} \times \frac{-R_2}{R_2 + r'_{s2}} \times 1 \times (-R_3) = 24$$

$$r_{in} = \infty \qquad r_{out} = R_3$$