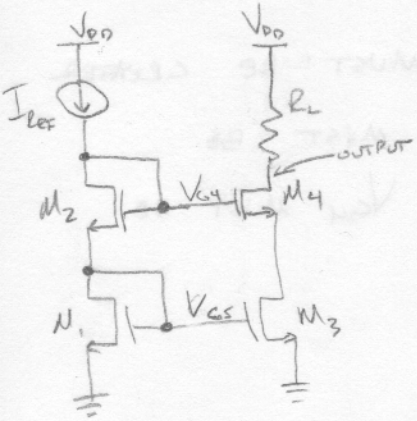
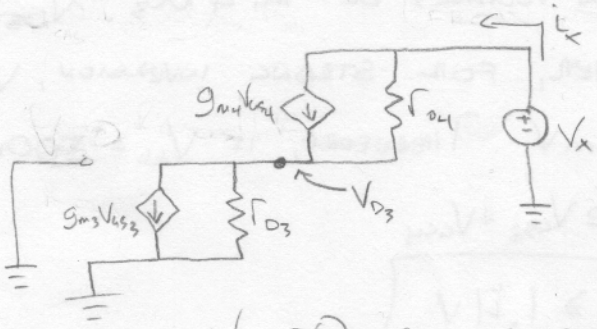
PART 2





* $V_{GS_3} = 0$ SO CURRENT SOURCE OF M_3 IS OPEN CIRCUITED.

$$R_o = \frac{V_x}{i_x} \qquad V_x - i_x r_{O4} - i_x r_{O3} - i_x (g_{m4} r_{O4} r_{O3}) = 0$$

$$R_{OCAS} = g_{m4} r_{O4} r_{O3} + r_{O3} + r_{O4}$$

$$R_{OCASC} \simeq g_{m4} r_{O3} r_{O4}$$

$$R_o = R_{OCASC} \parallel R_L$$

$$\boxed{R_o = \frac{g_{m4} r_{O3} r_{O4} R_L}{g_{m4} r_{O3} r_{O4} + R_L}}$$

$V_{ov} = 200mV$, $I_{REF} = 1mA$, $R_L = 500\Omega$

$\beta = 320 \frac{\mu A}{V^2}$, $V_{th} = 0.5V$

$V_{G3} = V_{GS1} = 700mV$, $V_{DS1} = V_{GS1} = 700mV$

$$I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_1 (V_{GS_1} - V_{th})^2 \left(1 + \frac{V_{DS1}}{V_A}\right)$$

$$\left(\frac{W}{L}\right)_1 = \left(\frac{W}{L}\right)_2 = 122.07$$

$$\boxed{W_1 = W_2 = 30.52\mu m}$$
$$\boxed{L_1 = L_2 = 0.25\mu m}$$

$V_A = V_{AL} \cdot L$ CHOOSE $L = 250nm$

$V_A = 2.5V$ $\qquad V_{AL} = 10 \frac{V}{\mu m}$

FOR 1% ACCURACY

$$1.01\, I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_3 (V_{GS_3} - V_{th})^2 \left(1 + \frac{V_{DS3}}{V_A}\right) \qquad V_{DS3} = V_{DS4} = 200mV$$

$$\left(\frac{W}{L}\right)_3 = \left(\frac{W}{L}\right)_4 = 146.122 \Rightarrow$$

$$\boxed{W_3 = W_4 = 36.53\mu m}$$
$$\boxed{L_3 = L_4 = 0.25\mu m}$$

FOR 10% ACCURACY

$$1.1\, I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_3 (V_{GS_3} - V_{th})^2 \left(1 + \frac{V_{DS3}}{V_A}\right)$$

$$\left(\frac{W}{L}\right)_3 = \left(\frac{W}{L}\right)_4 = 159.14 \Rightarrow$$

$$\boxed{W_3 = W_4 = 39.79\mu m}$$
$$\boxed{L_3 = L_4 = 0.25\mu m}$$