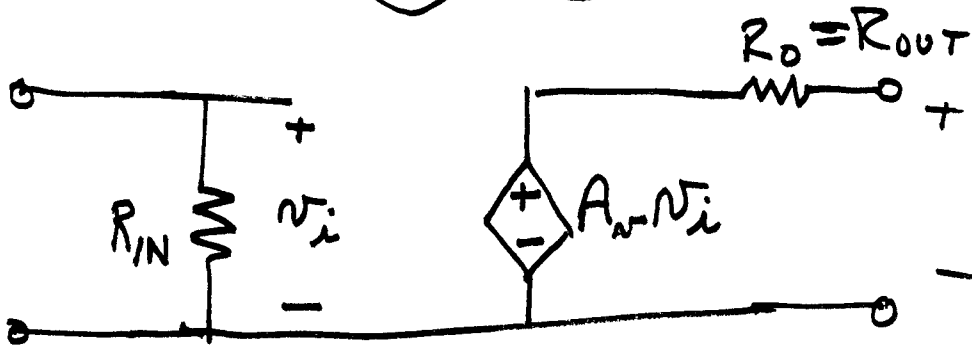
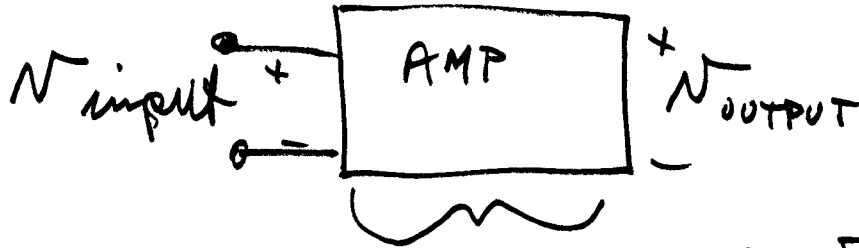
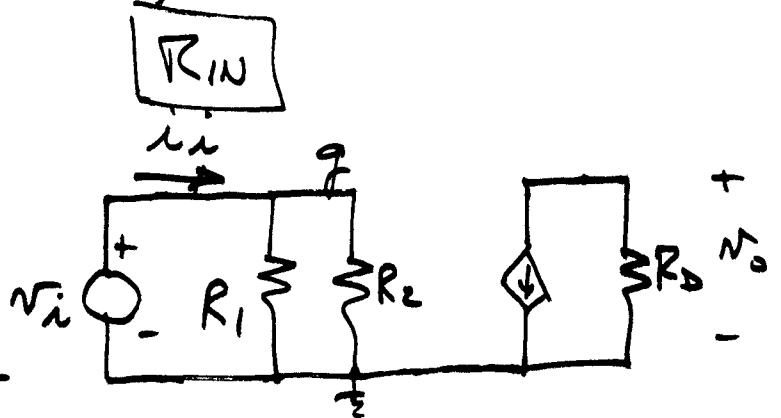
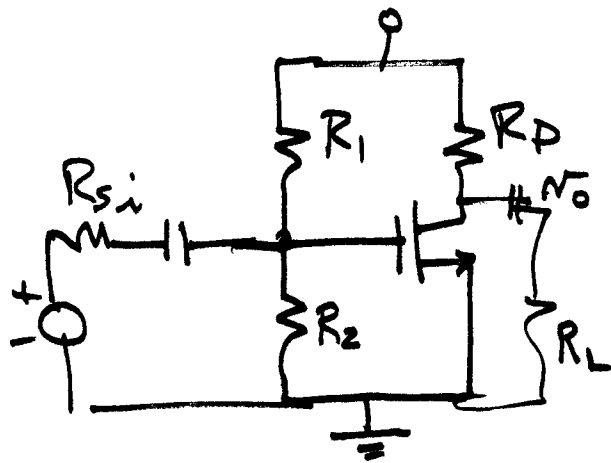


AMPLIFIERS: INPUT AND OUTPUT RESISTANCE (IMPEDANCE)

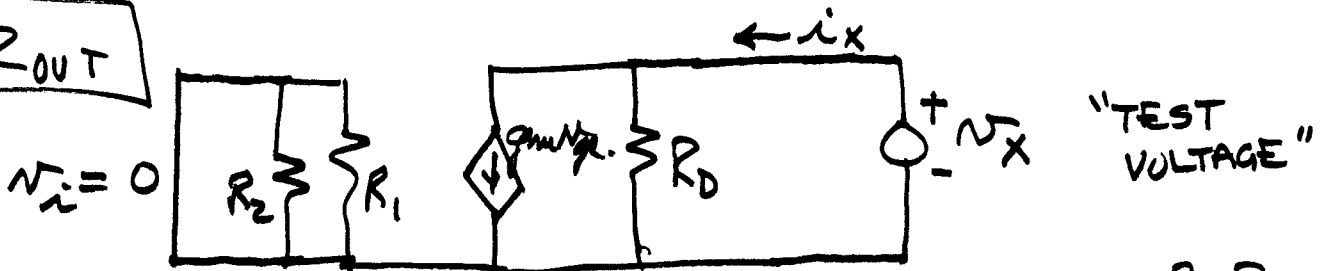


WANT R_{IN} TO BE LARGE, R_O TO BE SMALL



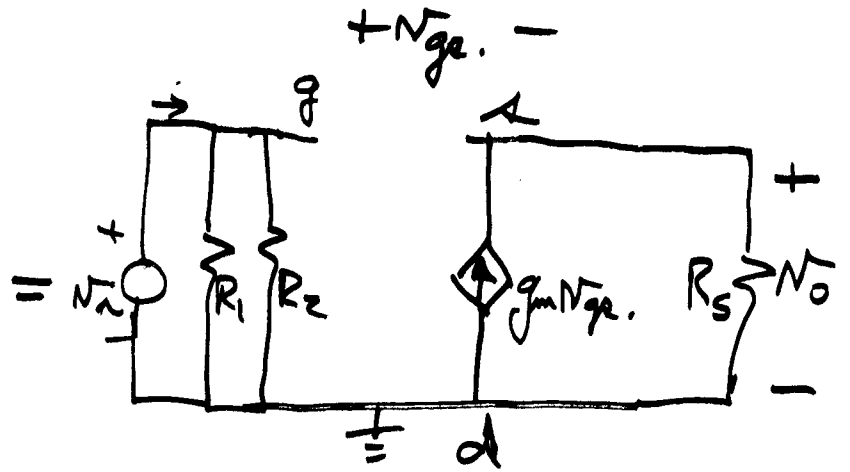
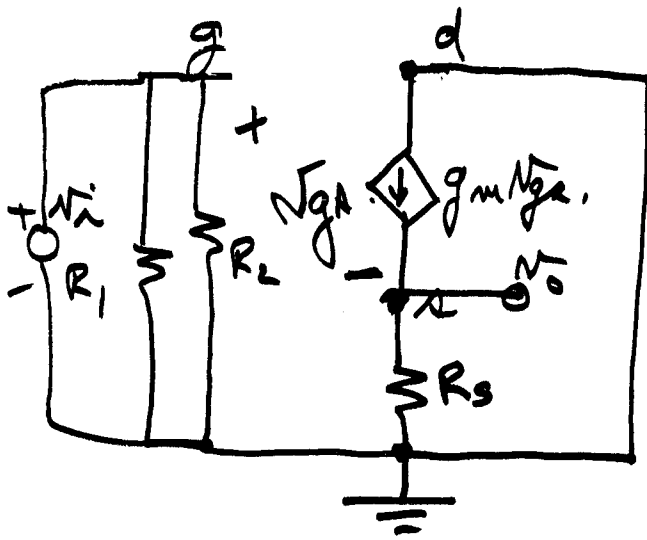
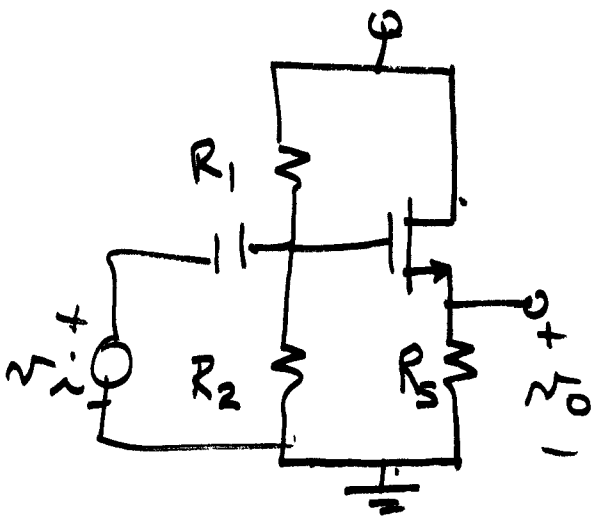
$$R_{IN} = \frac{v_i}{i_i} = R_1 // R_2$$

R_{OUT}



$$R_O = R_{OUT} = \frac{v_x}{i_x} = R_D$$

COMMON-DRAIN AMP
(SOURCE-FOLLOWER)



GAIN: $\frac{v_o}{v_i}$

KVL: $-v_i + v_{gs} + v_o = 0$

$v_o = g_m v_{gs} R_S$

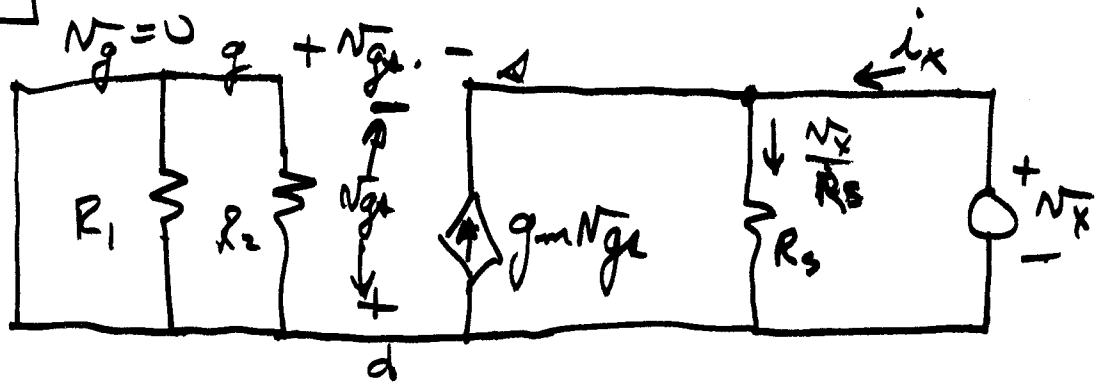
$-v_i + v_{gs} + g_m v_{gs} R_S = 0$

$v_i = v_{gs} (1 + g_m R_S)$

$$\frac{v_o}{v_i} = \frac{g_m v_{gs} R_S}{v_{gs} (1 + g_m R_S)} = \frac{g_m R_S}{1 + g_m R_S}$$

$R_{IN} = R_1 // R_2$

R_{out}



$$V_{gs} = -V_x$$

$$\text{KCL: } i_x = \frac{V_x}{R_3} - (g_m V_{gs}) = \frac{V_x}{R_3} + g_m V_x$$

$$\frac{V_x}{i_x} = \frac{1}{\frac{1}{R_3} + g_m} = R_o$$

R_o will be relatively small

