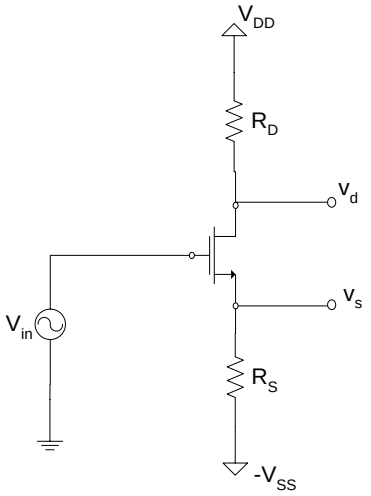
Problems with no solution – Chapter 4 (part #2)

#1

Consider the NMOS amplifier shown below. Replace the transistor with a T-equivalent model and find expressions for the gains v_s/v_i and v_d/v_i. Show that the gain v_d/v_i is approximately equal to the resistance in the DRAIN over the resistance in the SOURCE. This is a very useful approximation to roughly get FET "gain" by inspection!

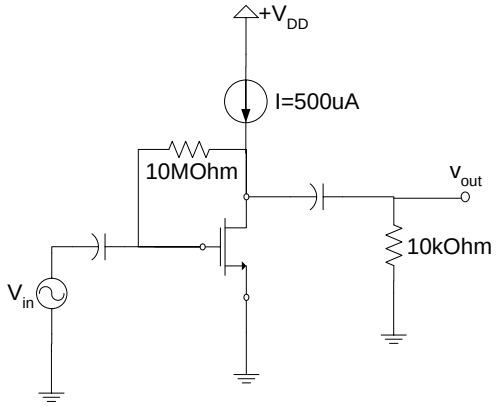


Circuit #1

#2

In the circuit below, the FET has $V_t = 0.9V$, $\lambda = 0.02V^{-1}$ and operates with $V_D = 2V$.

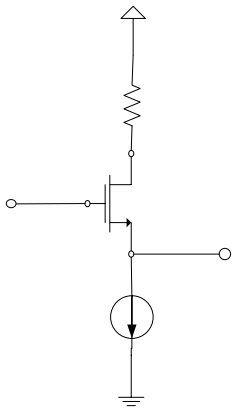
a) What is the voltage gain v_{out}/v_{in}?
b) What does V_D and the gain become if I is increased to 1mA?
c) What would the gain be if the 10MOhm resistor was neglected (open circuit)?
d) Calculate the input resistance of this circuit.



Circuit #2

#3

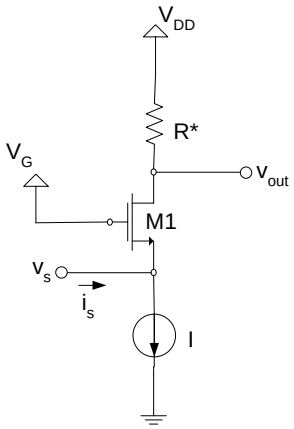
For this circuit, you must include the Body Effect, CLM and also the output resistance of the current source! Find an expression for the voltage gain v_{out}/v_{in}.



Circuit #3

#4

In this common-gate circuit, the resistor R* is implemented by a **diode-connected PMOS** transistor M2. Neglecting the output resistance of both transistors, and also the output resistance of the current source, find expressions for the voltage gain v_{out}/v_s and also the transresistance v_{out}/i_s.



Circuit #4

V_{in}