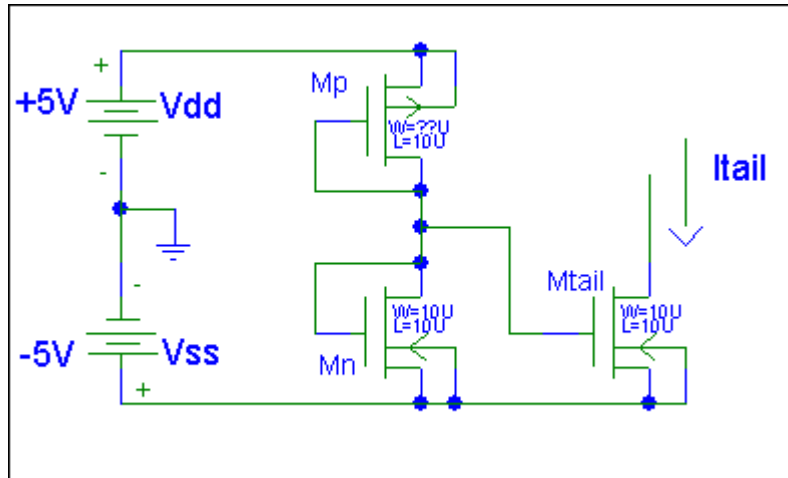


1. Using the following circuit with mnmosis and mpmosis transistors design a current source (as a sink) to create a current, I_{tail} , of 2 milliAmps for use in a differential pair circuit (problem 2 below)



- 2.a) Following Figure 7.34, p. 738, design a differential pair using 2n2904 BJTs for the main pair (Q1 & Q2), the above current source for I_{tail} , and 2n2906 pnp BJTs for the current mirror (Q3 & Q4) to give $I_{out} \cong \alpha * I_{tail} * \tanh[v_{in}/(2V_T)]$. To measure the output current, I_{out} , you can use an F component (a current controlled current source) with input I_{out} & ground and output into a resistor and ground.
b) Replace the pnp current mirror by a PMOS, mpmosis, one and compare the results.
Submit your schematics and Spice runs confirming your designs.