1. a) Draw the cross section of a mosfet.
   b) Explain in your own words and drawings as needed how, when(under what conditions), and in what direction the current flows in the mosfet.
   c) Explain in your own words all the different regions for Fig. 4.6 by drawing cross-sections of the mosfet to correspond to each region in that figure and explaining how each region operates(i.e. how the channel looks, how the current flows, etc).

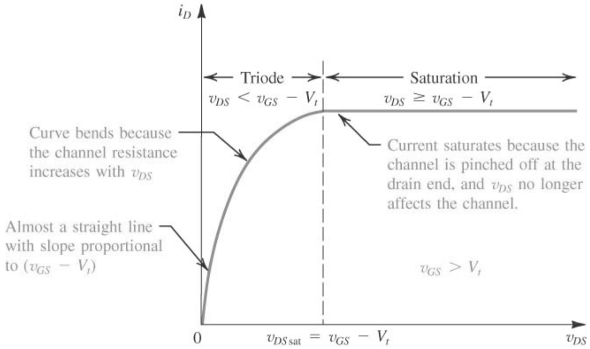


Fig 4.6

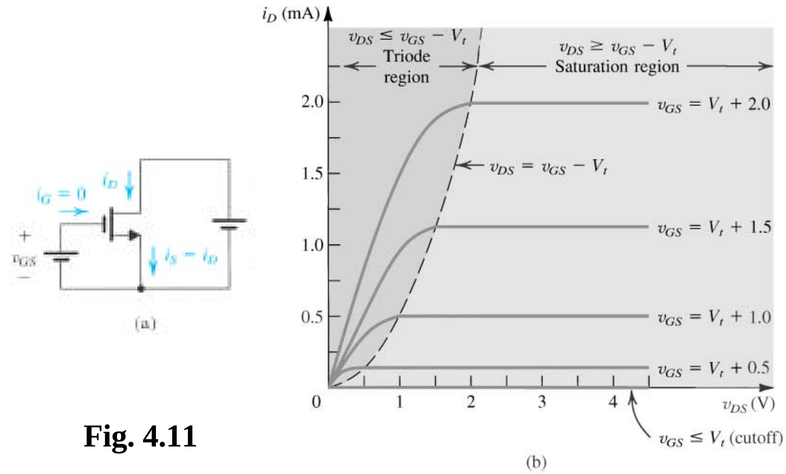


Fig. 4.11

2. a) Explain in your own words the difference between Fig. 4.6 and Fig. 4.11 .

   b) What equation and region of operation is graphed in Fig. 4.12.

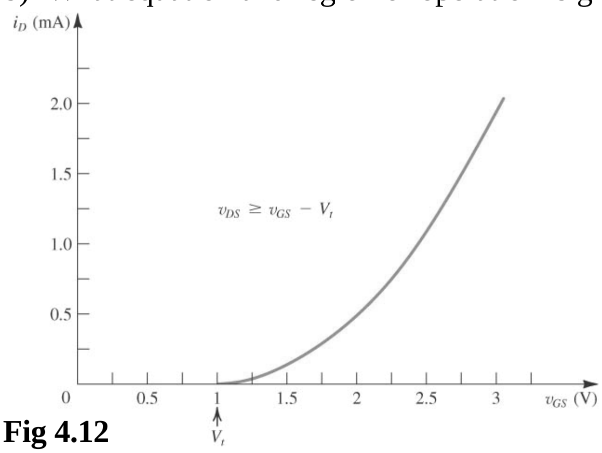
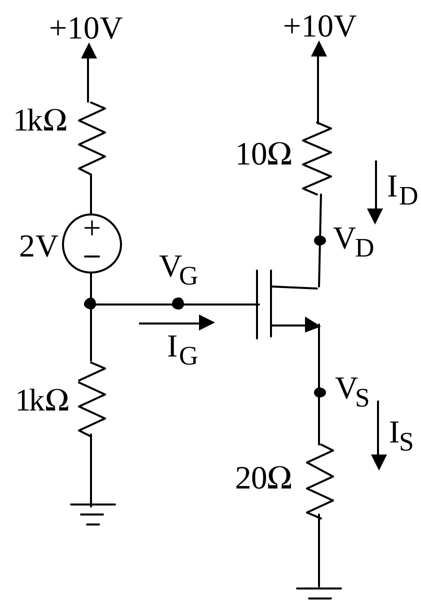


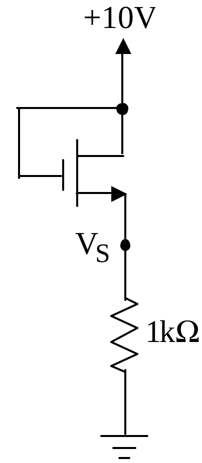
Fig 4.12

   c) Explain in your own words how the PMOS differs from the NMOS transistor.

3. Analyze the circuit at the right to determine the voltages (V_D, V_G, V_S) at all nodes and the currents through all branches (5 currents). Let V_t=2V and k_n'(W/L)=2A/V^2. Neglect the channel length modulation effect (i.e. λ=0).

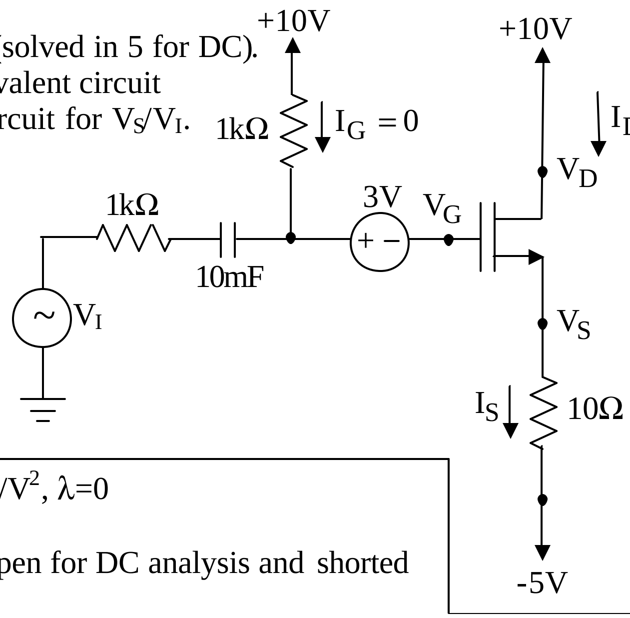


4. Solve the circuit to the right to find V_S. Assume $\lambda=0$ and $|V_t|=1$, $k_n'(W/L)=1mA/V^2$.



5. Use: $V_t=1V$, $K_n'(W/L)=10\mu A/V^2$, $\lambda=0$
   $V_I = 5+0.001\sin(10t)$
   Assume all capacitors are open for DC analysis and shorted for AC analysis
   (a) Solve for the DC currents: I_G, I_D, and I_S
   (b) Solve for the DC voltages: V_G, V_S and V_D
   (c) State the operating point, bias point, or quiescent point for this amplifier

6. Use the circuit from at the right(solved in 5 for DC).
   (a) Draw the small-signal equivalent circuit
   (e) Analyze the small-signal circuit for V_S/V_I.



7. Use: $V_t=2V$, $K_n'(W/L)=100\mu A/V^2$, $\lambda=0$
   $V_I = 3+0.001\sin(10t)$
   Assume all capacitors are open for DC analysis and shorted for AC analysis
   (c) Solve for the DC currents: I_G, I_D, and I_S
   (d) Solve for the DC voltages: V_G, V_S and V_D
   (c) State the operating point, bias point, or quiescent point for this amplifier

8. Use the circuit at the right. (Solved in 7 above for DC).
   (a) Draw the small-signal equivalent circuit
   (e) Analyze the small-signal circuit for V_D/V_I.