Review of Last Lecture

- Threshold Voltage Equation
Today's Lecture

- Some Example of MOS Circuits

Example 1: Region of Operation

In the circuit configurations below:

1. Identify Drain and Source terminals assuming the device is an NMOS
2. Identify operating region of each transistor (cutoff, linear, saturation)
3. Write the drain current equation

Assume $V_T = 0.5 \, V$, $K = \frac{W}{L}$, $I_D = \frac{mA}{V}$; Ignore the body effect.
Example 2: Gate Bias Problem

3.7. Given that $I_D = 250 \ \mu A$, $V_{th} = 0.5 \ \text{V}$, and $W/L = 3$. What $V_D$ makes transistor biased at the saturated/non-saturated boundary.

![Gate Bias Problem Diagram]

Example 3: PMOS Circuit

3.12. Calculate $I_D$ and $V_O$ for circuit where $V_{th} = -0.8 \ \text{V}$, $K_p = 30 \ \mu A/\text{V}^2$, and $W/L = 2$.

![PMOS Circuit Diagram]
Example 4: Current Equation

- Find $I_{in}$ as a function of $V_{in}$ assuming $V_T < V_{in} < V_{DD} - V_T$ (assume long channel device and ignore channel length modulation).