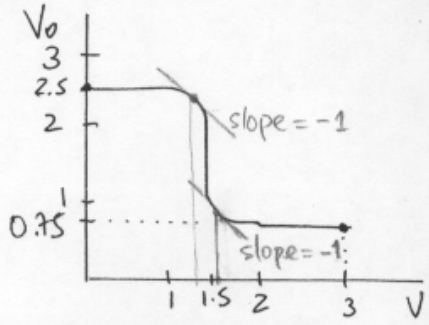
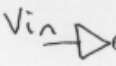
EEC 118 (Prof. V.G. Oklobdzija) **Quiz -2** **Spring 2003**

Your Name: Solution

Chapter 2: Problem 1 (10 points): Determine noise margins for the inverter with characteristics shown:





$V_{OL} = 0.75\,V$; $V_{OH} = 2.5\,V$

$V_{IL} \simeq 1.3V$; $V_{IH} \simeq 1.6\,V$

Then,

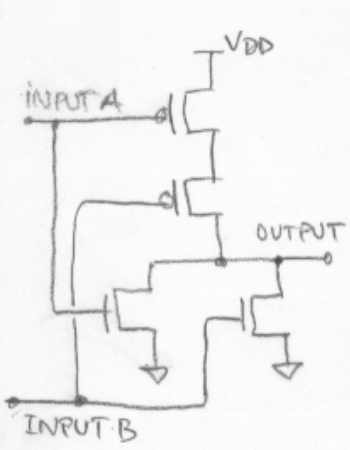
$NM_H = V_{OH} - V_{IH} = 2.5 - 1.6 = 0.9V$

$NM_L = V_{IL} - V_{OL} = 1.3 - 0.75 = 0.55V$

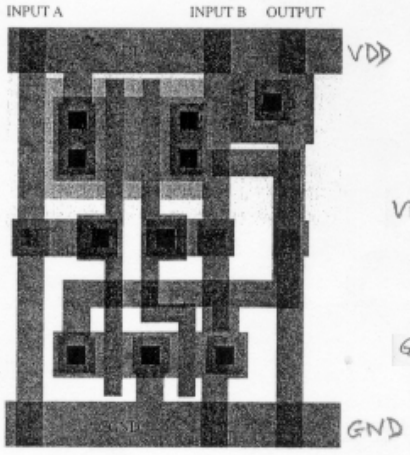
Chapter 2: Problem 2 (10 points): Fill in the name of the region that corresponds to the given transistor current expression:

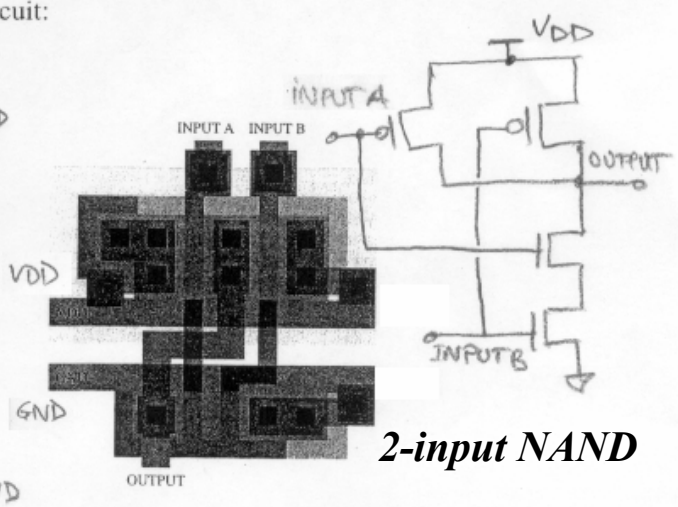
$$I_{ds} = \begin{cases} 0 & \cdots \text{region} = \text{cut-off} \\ \beta\left[(V_{gs} - V_t)V_{ds} - \frac{V_{ds}^2}{2}\right] & \cdots \text{region} = \text{linear} \\ \frac{\beta}{2}(V_{gs} - V_t)^2 & \cdots \text{region} = \text{saturation} \end{cases}$$

Chapter 2: Problem 2 (10 points): Do the reverse engineering on those two layouts (a) and (b). Draw the schematic diagram for each circuit:



2-input NOR





2-input NAND