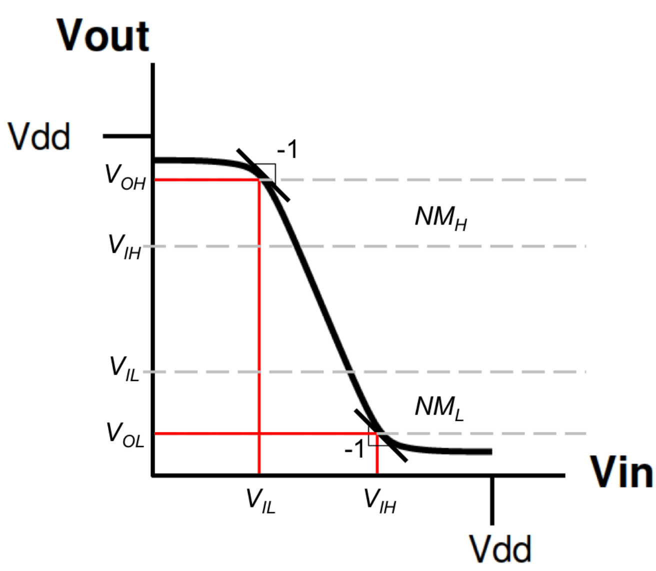
Please work before lecture starts.

1. Consider a wire 1 μm wide and 1 μm tall with a resistivity ρ=10^{-7}Ohm-m.

What is the resistance of the 100 μm long wire?	
a 1 mm long wire?	
a 1cm long wire?	
How large is an Integrated Circuit chip (die) (e.g. your desktop or laptop processor)?	

Regeneration/Restoration/Static Discipline:



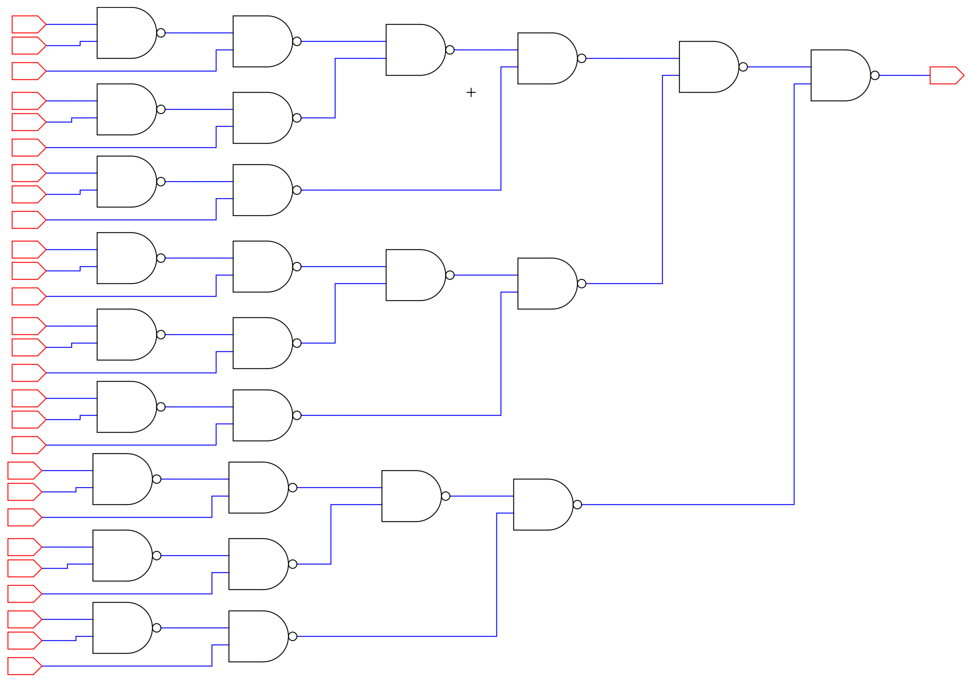
$$NM_H = V_{OH} - V_{IH} \quad (1)$$

$$NM_L = V_{IL} - V_{OL} \quad (2)$$

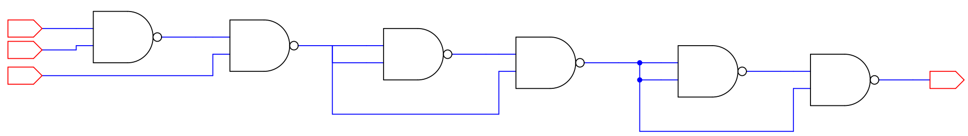
As long as input(s) respect: $V_{in} < V_{IL}$ or $V_{in} > V_{IH}$,
output, V_{out}, will have: $V_{out} < V_{OL}$ or $V_{out} > V_{OH}$

Please work before lecture starts.

2. Consider the cascading gate structure below:



Hint: When inputs are equivalent, you can exploit symmetry to use the following simplified circuit for reasoning: (Convince yourself these are equivalent.)



What is the digital output assuming ideal NAND gates and all inputs are logical 1?	
What is the output assuming all inputs are 1.0 and each NAND gate computes the real-valued function NAND(A, B)=(1.0 – $(A \times B)$) where A, B are the real-valued inputs to the NAND2 gate and '-' and '×' are the real-valued mathematical operators. Use table below for intermediary outputs.	
What is the output assuming all inputs are 0.95 and each nand gate computes NAND(A, B)=(1.0-A×B) [same assumptions as above and table below].	

Hint: When inputs are at 0.95, output of first NAND2 gate is: $1.0 - (0.95)^2 \approx 0.1$.

	Value after i-th NAND2 gate					
input	1	2	3	4	5	6
1.0						
0.95	0.1					