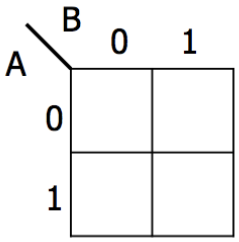
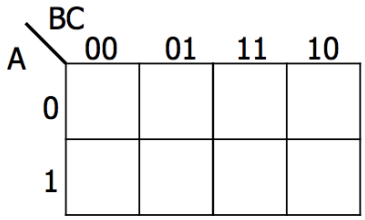
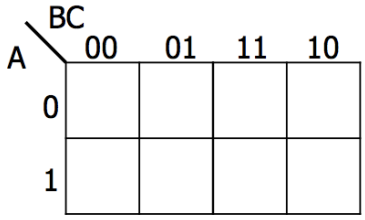
1. Simplify the boolean expression $Z = \overline{A} \cdot \overline{B} + A \cdot \overline{B} + \overline{A} \cdot B$ to the minimum sum of products with the 2-variable K-map:



2. Simplify the boolean expression $Z = \overline{A} \cdot \overline{B} \cdot \overline{C} + \overline{A} \cdot B + A \cdot B \cdot \overline{C} + A \cdot C$ to the minimum sum of products with the 3-variable K-map:

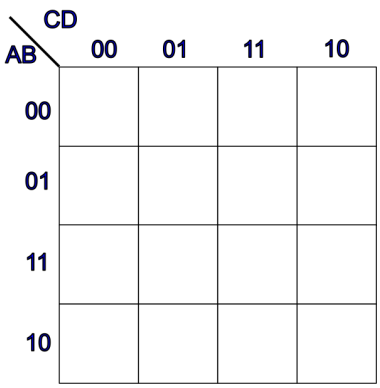


3. Extra practice for outside of class:
Simplify the boolean expression $Z = A \cdot B \cdot C + A \cdot B \cdot \overline{C} + \overline{A} \cdot B \cdot C$ to the minimum sum of products with the 3-variable K-map:



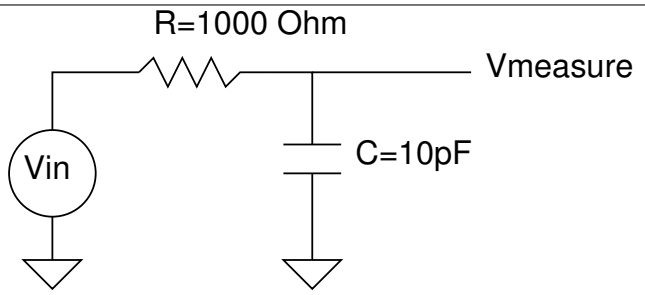
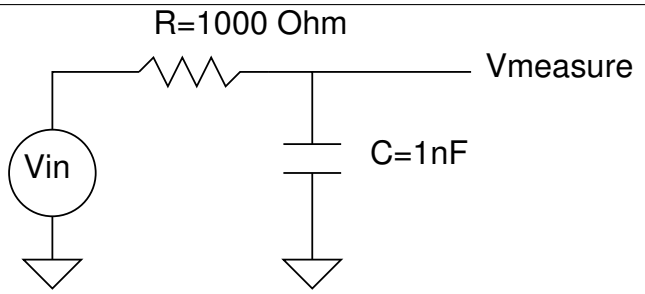
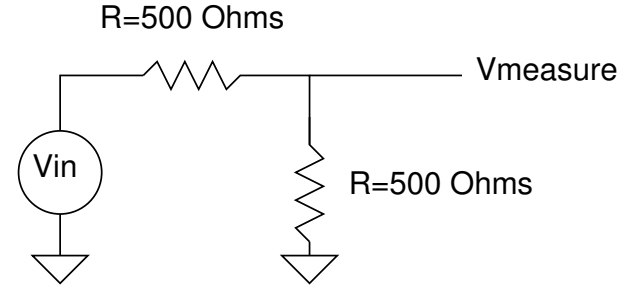
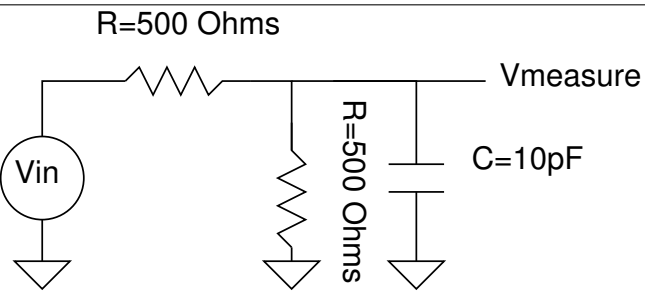
Simplify the truth table to the minimum sum of products with the 4-variable K-map:

A	B	C	D	Z
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

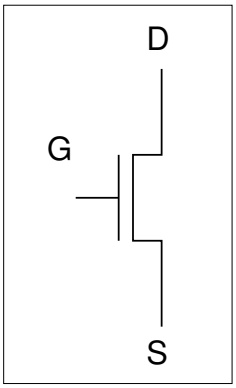


Assume V_{in} is 0 for $t < 0$ and steps to 1V at $t = 0$.

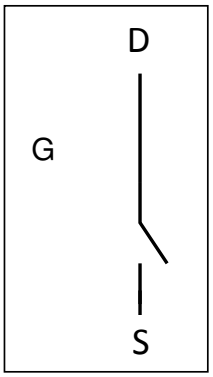
4. What value does $V_{measure}$ take on as $t \to \infty$?

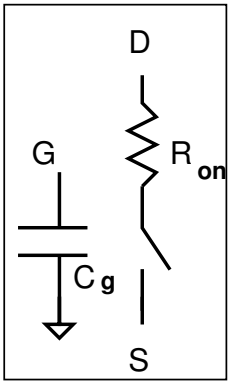
N-type MOSFET

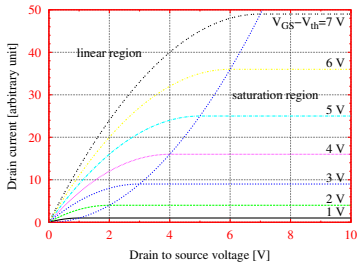


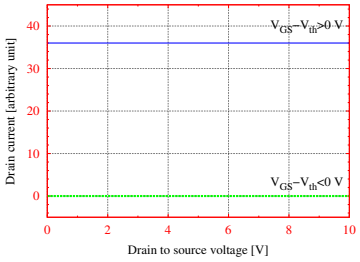
Zero-Order Model

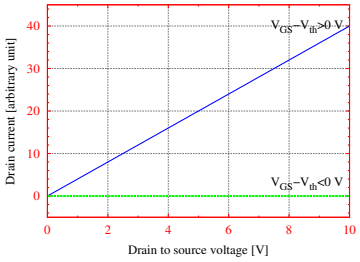


First-Order Model

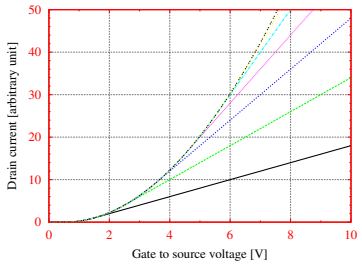


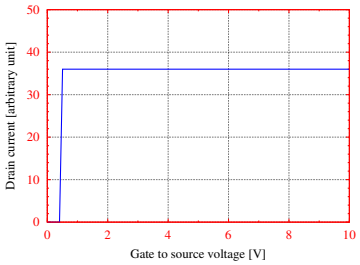


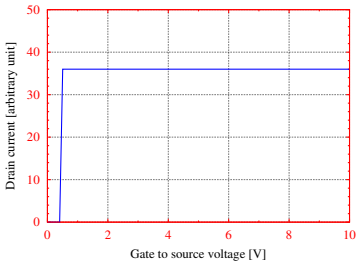




I_{ds} unbounded when $V_{gs} > V_{th}$







(even this is a simplified approximation)

Step at $V_{gs} = V_{th}$

Reminder:

	NMOS	PMOS
Threshold	$V_{thn} > 0$	$V_{thp} < 0$ $V_{thp} \approx -V_{thn}$
Conduct	positive input $V_{gs} > V_{thn}$	negative input $V_{gs} < V_{thp}$
Drain	most positive terminal	most negative terminal
Source	most negative terminal (source of electrons)	most positive terminal (source of holes)

$$V_{gs} = V_g - V_s \tag{1}$$