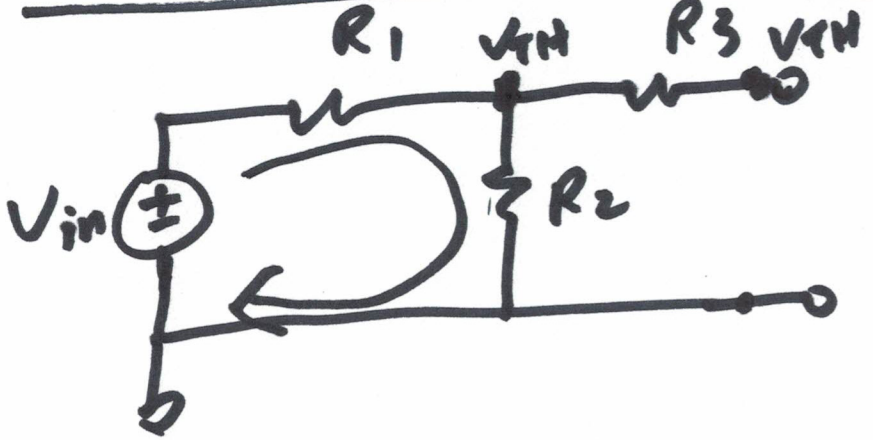
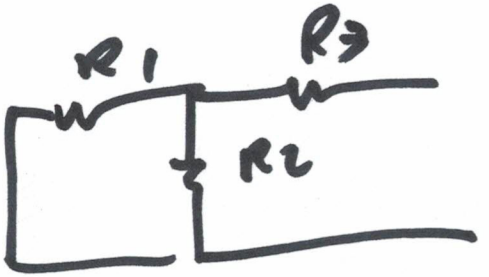
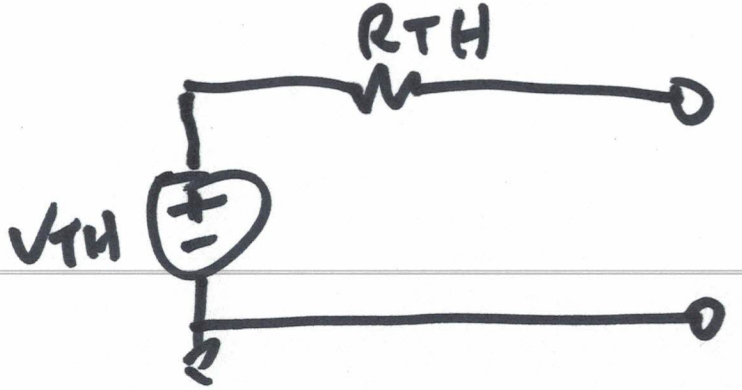
Thevenin's equivalent circuit

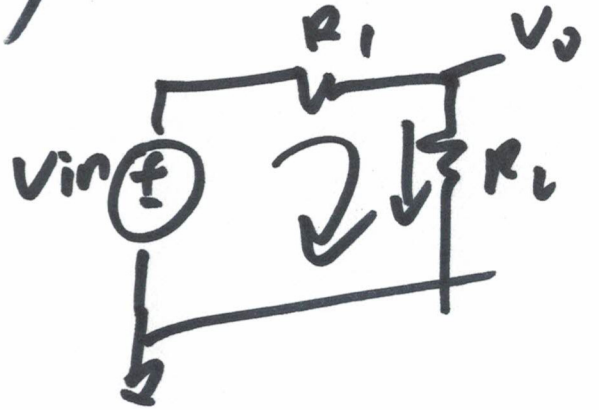


R_{TH}: 

$R_3 + (R_1 // R_2)$

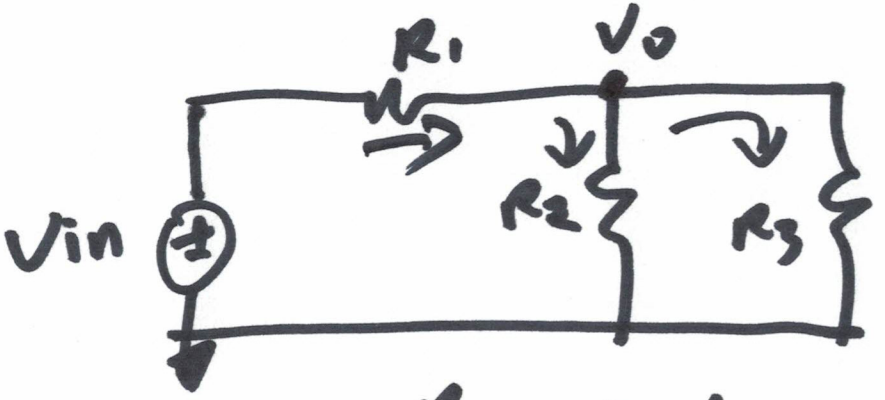
V_{TH}: $V_{TH} = V_{in} \frac{R_2}{R_1 + R_2}$



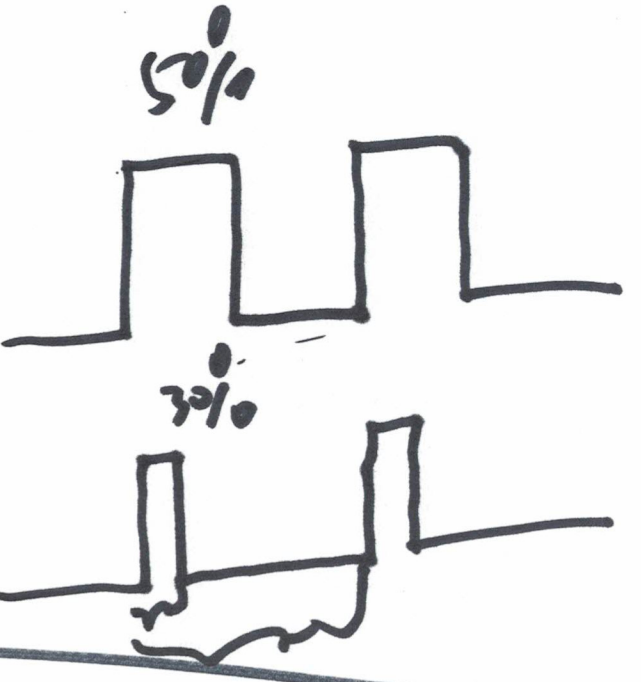


$$\frac{V_o}{V_{in}} = \frac{I \cdot R_2}{I (R_1 + R_2)}$$

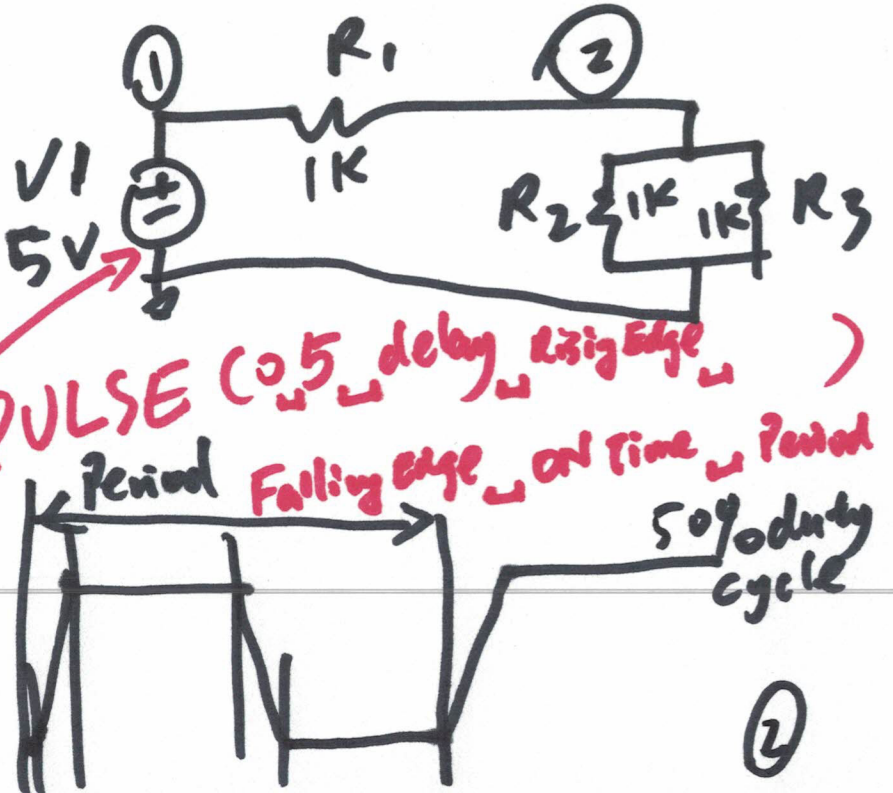
$$V_o = V_{in} \frac{R_2}{R_1 + R_2}$$



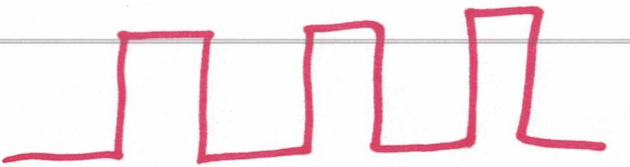
$$V_o = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$ ✗



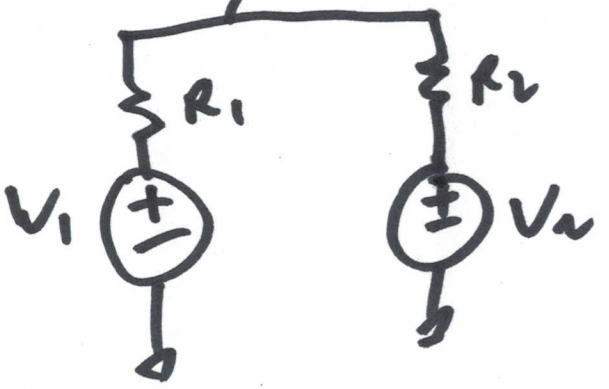
SPICE



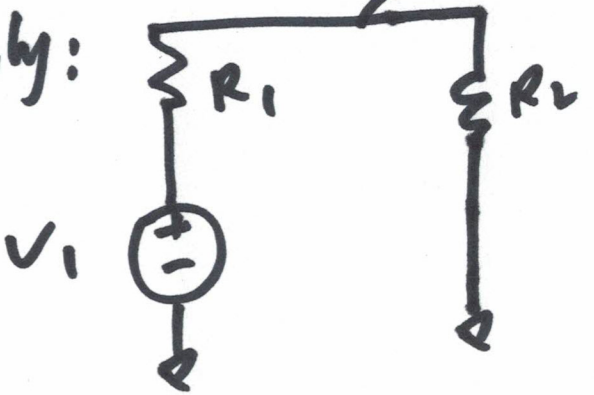

```
V1  1  0  5V
R1  1  2  1K
R2  2  0  1K
R3  2  0  1K
.tran 0 1 0.001
```



Superposition

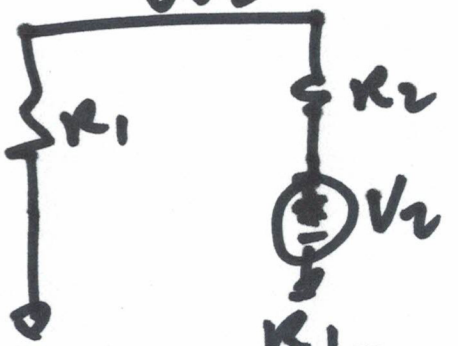


V_1 only:



$V_{01} = V_1 \frac{R_2}{R_1+R_2}$

V_2 only:

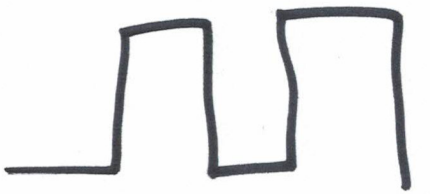


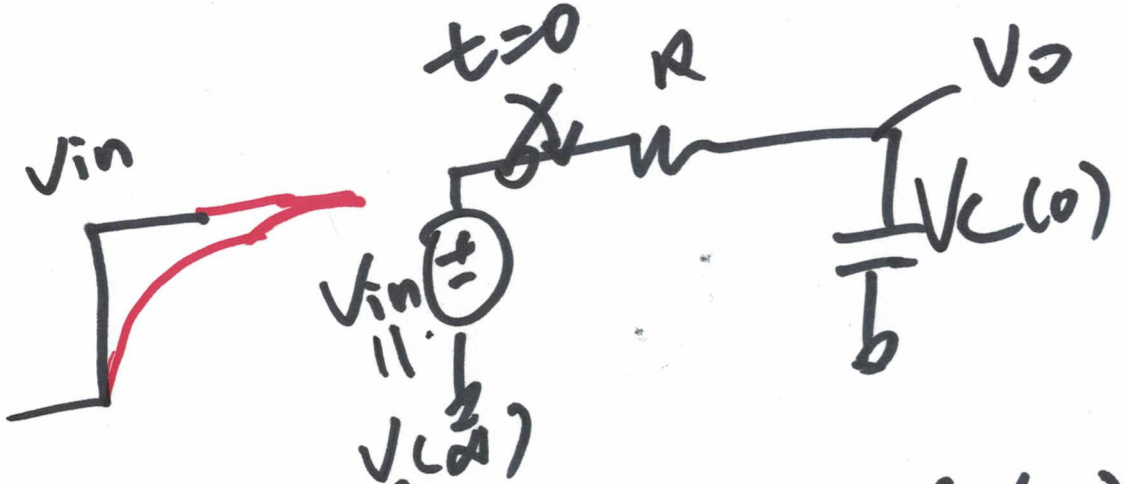
$V_{02} = V_2 \cdot \frac{R_1}{R_1+R_2}$

$$V_o = V_{01} + V_{02} = V_1 \frac{R_2}{R_1+R_2} + V_2 \cdot \frac{R_1}{R_1+R_2}$$

DAC

parasitic capacitors



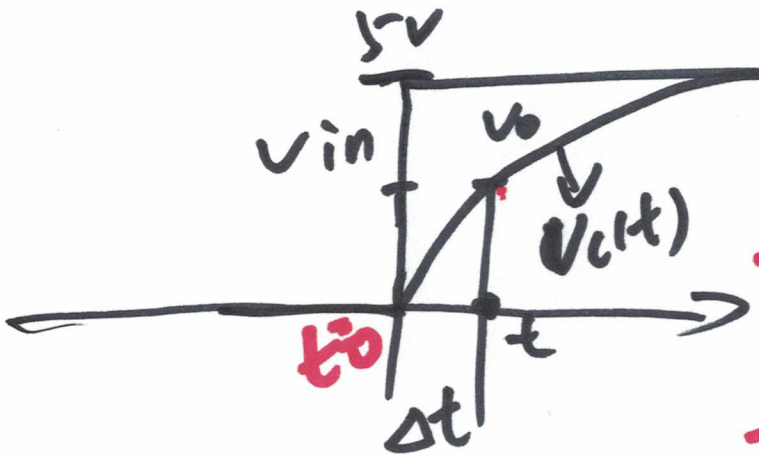


$$V_c(t) = V_c(\infty) + (V_c(0) - V_c(\infty))\, e^{-t/RC}$$

I : $V_c(0) \neq 0$

II : $V_c(0) = 0$, $V_c(t) = V_c(\infty) - V_c(\infty) \cdot e^{-t/RC}$

$= V_c(\infty)(1 - e^{-t/RC})$



$$V_C(t) = V_C(\infty)\left(1 - e^{-t/RC}\right)$$

$$\frac{1}{2}V_C(\infty) = V_C(\infty)\left(1 - e^{-t/RC}\right)$$

$$e^{-t/RC} = 0.5$$

$$\ln e^{-t/RC} = \ln 0.5$$

$$\frac{-t}{RC} = -0.7$$

$$\boxed{t = 0.7RC}$$