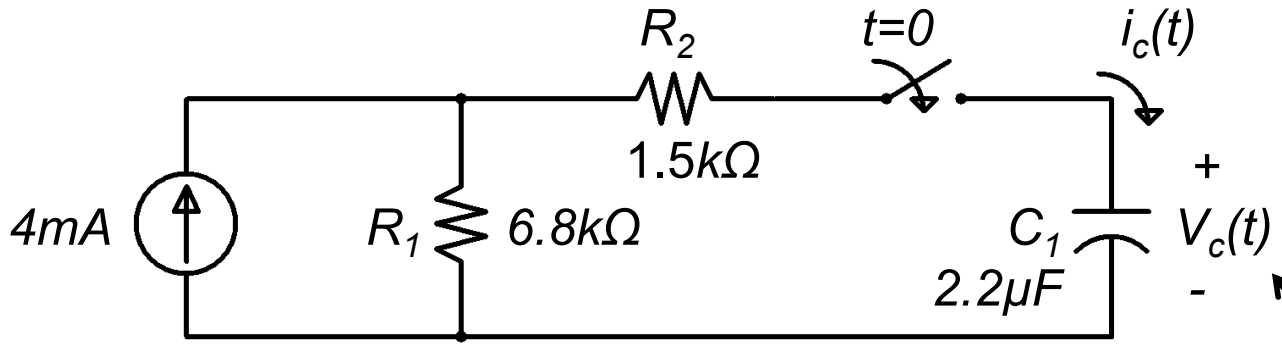
Initial Values

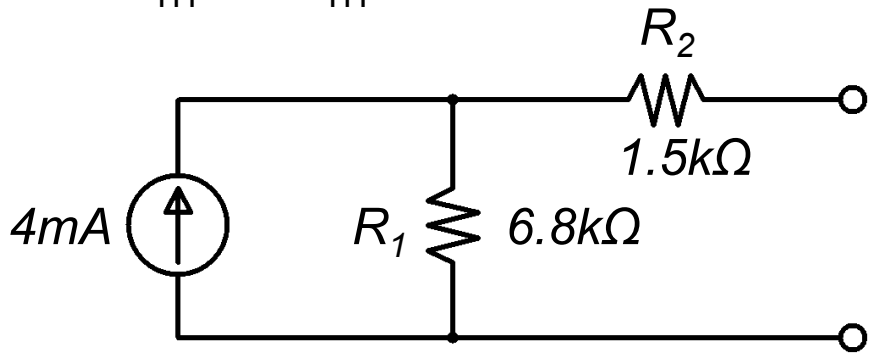
(Example) a) Find $V_c(t)$ & $i_c(t)$ for $t > 0$
b) Sketch $V_c(t)$ & $i_c(t)$



$V_c(t) = 2V$
@ $t = 0^-$ (Initial Charge)

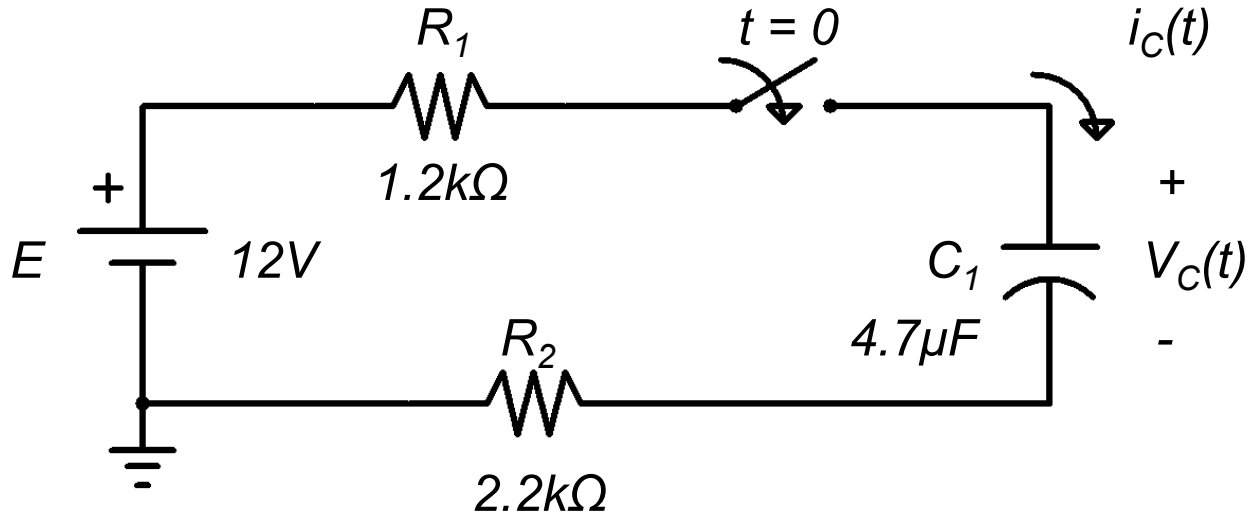
What's our first step??

Find V_{TH} & R_{TH} for $t > 0$:



$V_{TH} = (4mA)(6.8k\Omega) = \underline{27.2V}$

$R_{TH} = R_1 + R_2 = \underline{8.3k\Omega}$



Given: $V_C(0) = 4V$, initial charge

(a) Find $V_C(t)$, $t \geq 0$

(b) $i_C(t)$, $t > 0$

(c) Sketch $V_C(t)$ & $i_C(t)$

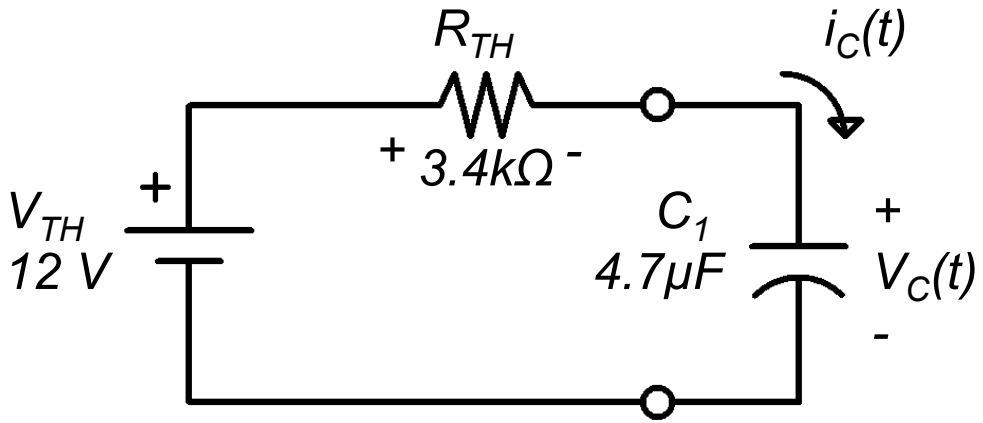
(b) $i_c(t) = i_{cmax} \cdot e^{-t/\tau}$ (R_{TH})

$$\tau = (R_1 + R_2)C_1$$

$$\tau = (3.4k\Omega)(4.7\mu F) = 15.98ms$$

$$i_{cmax} = \frac{12V - 4V}{3.4k\Omega} = 2.353mA \quad (V_{TH},\ V_c(0))$$

$$\therefore i_c(t) = 2.353 \cdot 10^{-3} \cdot e^{-t/15.98 \cdot 10^{-3}} A, t > 0$$



(a) $KVL: V_{TH} - i_C(t)R_{TH} - V_C(t) = 0$

$$KVL: V_{TH} - i_C(t)R_{TH} - V_C(t) = 0$$

$\therefore$

or $V_c(t) = 12 - \left(2.353 * 10^{-3} * e^{-t/15.98*10^{-3}}\right)(3.4 * 10^3)$

$V_c(t) = 12 - 8 * e^{-t/15.98*10^{-3}}$ V, $t \geq 0$