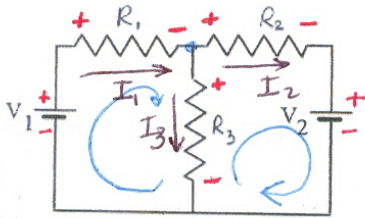


(3) (a) (10 points) Three resistors and two batteries are connected as shown in the circuit diagram. The three resistances and the two voltages are known. Please clearly label the currents in the circuit and indicate their direction (chosen by you). Then write enough independent equations to solve for the currents (You don't need to solve for them.).



$$\text{KJR: } I_1 = I_2 + I_3$$

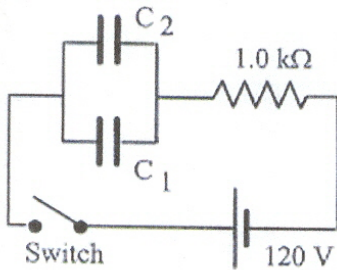
$$\text{KLR } \Sigma \text{ pot. rises} = \Sigma \text{ pot. drops}$$

$$\text{left loop } V_1 = I_1 R_1 + I_3 R_3$$

$$\text{right loop } I_3 R_3 = I_2 R_2 + V_2$$

(3) (b) An RC circuit consists of a resistor with resistance  $1.0 \text{ k}\Omega$ , a  $120 \text{ V}$  battery, and two capacitors,  $C_1$  and  $C_2$ , with capacitances of  $20.0 \mu\text{F}$  and  $60.0 \mu\text{F}$ , respectively. Initially, the capacitors are uncharged, and the switch is closed at  $t = 0 \text{ s}$ .

(5 points) What is the current through the resistor *a long time* after the switch is closed?



(5 points) (c) What is the time constant of the circuit?