9/21/2017 (1:54 pm)

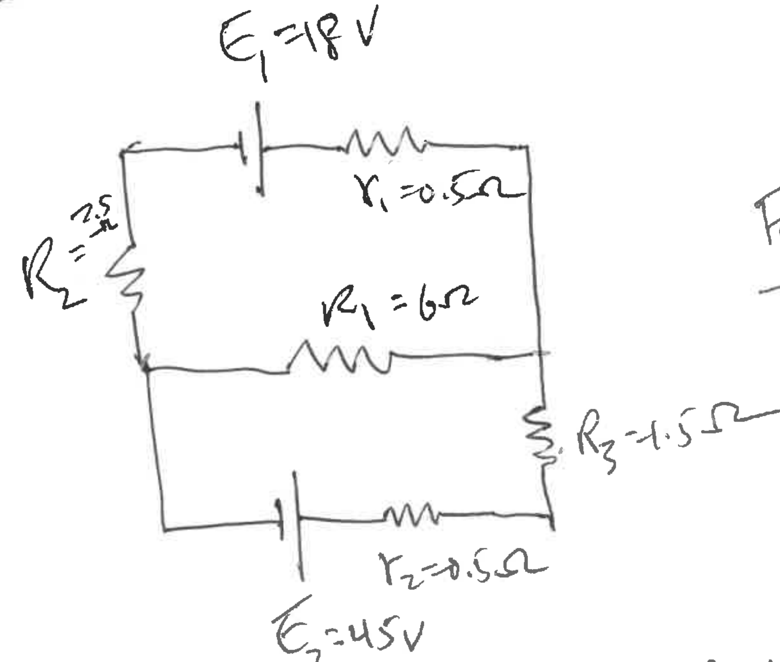
(P.1)

Kirchhoff' rules today, (ex. featured)

because I did produce the correct result using the ways I believe to be correct, why?

→ figure this out!

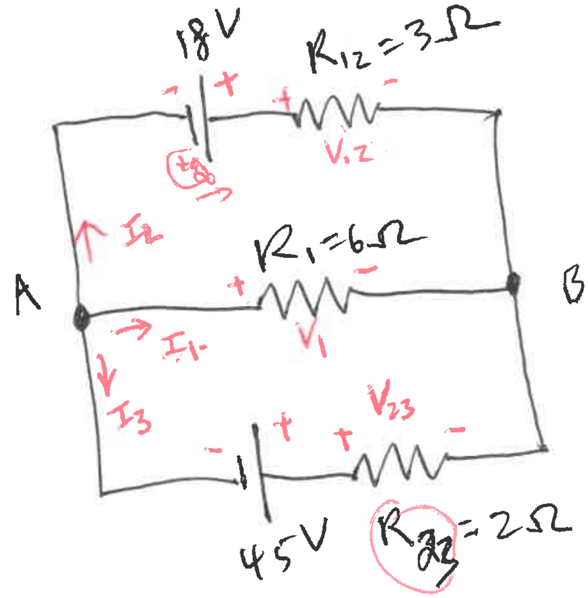
the circuit:



Find: I in each resistor! including its direction

Step #1: simplify the circuit. R_3 & r_2 in series, R_2 & r_1 in series

{ i.e. they should have same current



$R_{12} = r_1 + R_2$
$R_{23} = r_2 + R_3$

Step #2: Since we do not know exact current direction before solving the problem. We can assume the direct of currents @ the junction A or node A

Since the direction's of currents are assumed, the voltage drop or voltage difference on each resistor should be consistent to the assumed the current direction! (+q) $\overset{+\quad -}{\xrightarrow{I}}$

Step #3: Apply Kirchhoff's rule

Ohm's Law
$V_{12} = I_2 R_{12} = 3I_2$
$V_1 = I_1 R_1 = 6I_1$
$V_{23} = I_3 R_{23} = 2I_3$

@ junction A, no charge accumulation (build-up)

$I_{out \to A} \to$ "−"
$I_{in \to A} \to$ "+" current

$\to$ $-I_2 - I_1 - I_3 = 0$ --- (1)

(for) Ug up loop: (q_0) $\to$ "ΔU_s the e-potential gain" (for q_0)

could "ΔU_s the work e-force done"

$q_0 V$

(V)

$q_0 \times$

$18 - V_{12} + V_1 = 0$

$18 - 3I_2 + 6I_1 = 0$ --- (2)

(8) low loop:

$45 - V_{23} + V_1 = 0$

$45 - 2I_3 + 6I_1 = 0$ --- (3)

replace I_3 in (3) using (1) $I_3 = -I_2 - I_1$

$45 - 2(-I_2 - I_1) + 6I_1 = 0$

$45 + 2I_2 + 2I_1 + 6I_1 = 0$

$2I_2 + 8I_1 = -45$ --- (3)

Rewrite ② & ③

$$\begin{cases} -3I_2 + 6I_1 = -18 & ② \\ 2I_2 + 8I_1 = -45 & ③ \end{cases} \quad \begin{matrix} \times 2 \\ \times 3 \end{matrix}$$

$$\hookrightarrow \begin{cases} -6I_2 + 12I_1 = -36 & ② \\ 6I_2 + 24I_1 = -45 \times 3 & ③ \end{cases}$$

② + ③ $\rightarrow$ $36I_1 = -36 - 135 = -171$

$$\rightarrow I_1 = -\frac{171}{36} = -4.75\ A$$

$I_1 = -4.75A \rightarrow$ ③ :

$$2I_2 + 8(-4.75) = -45$$

$$2I_2 - 38 = -45$$

$$2I_2 = -45 + 38 = -7$$

$$\rightarrow I_2 = -7/2 = -3.5\ A$$

Finally : ① ②

$$I_3 = -I_1 - I_2 = -(-4.75) - (-3.5)$$

$$= 8.25\ A$$