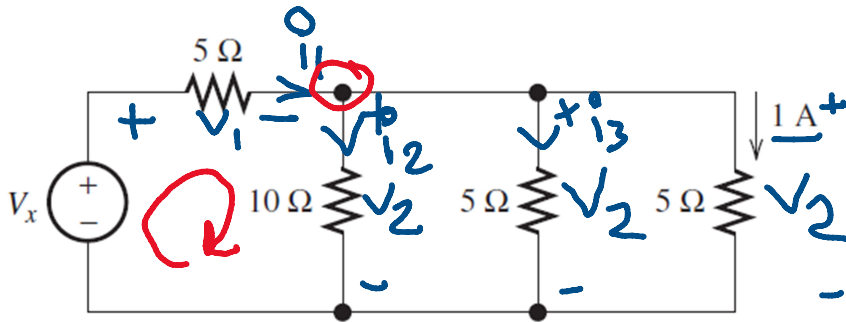


Applying all 3 laws (Ohm's law, KCL & KVL)

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No of Series Elements ?? - 0

No of parallel Elements ?? - 3

$$V_2 ? \text{ OHM's Law } V_2 = 1 * 5 = 5V$$

$$I_1 ? \text{ KCL}$$

$$V_1 ?? \text{ Ohm's Law}$$

$$I_3 = V_2 / 5 = 1A$$

$$I_1 = i_2 + i_3 + 1$$

$$V_1 = 2.5 * 5 = 12.5V$$

$$I_2 = 0.5A$$

$$I_1 = 2.5A$$

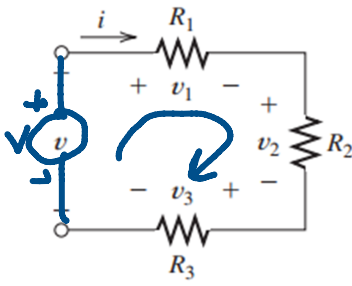
$$V_x ? \text{ KVL}$$

$$-V_x + V_1 + V_2 = 0$$

$$V_x = 17.5V$$

Series Resistances

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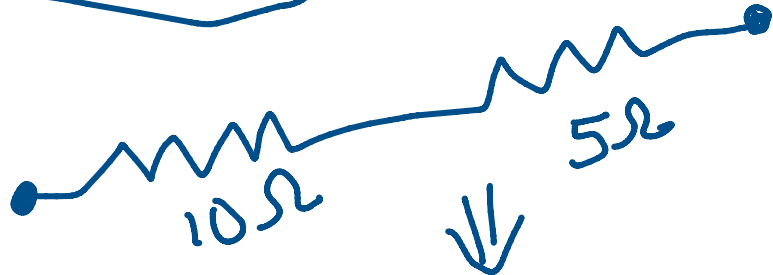
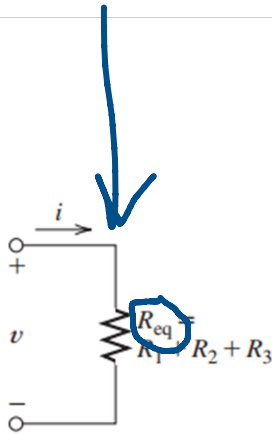


KVL Loop1

$$V_1 + V_2 + V_3 = V$$

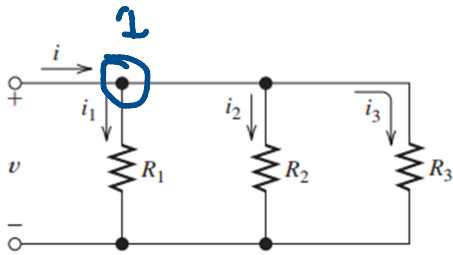
$$V = iR_1 + iR_2 + iR_3$$

$$V = I (R_1 + R_2 + R_3)$$



Parallel Resistances

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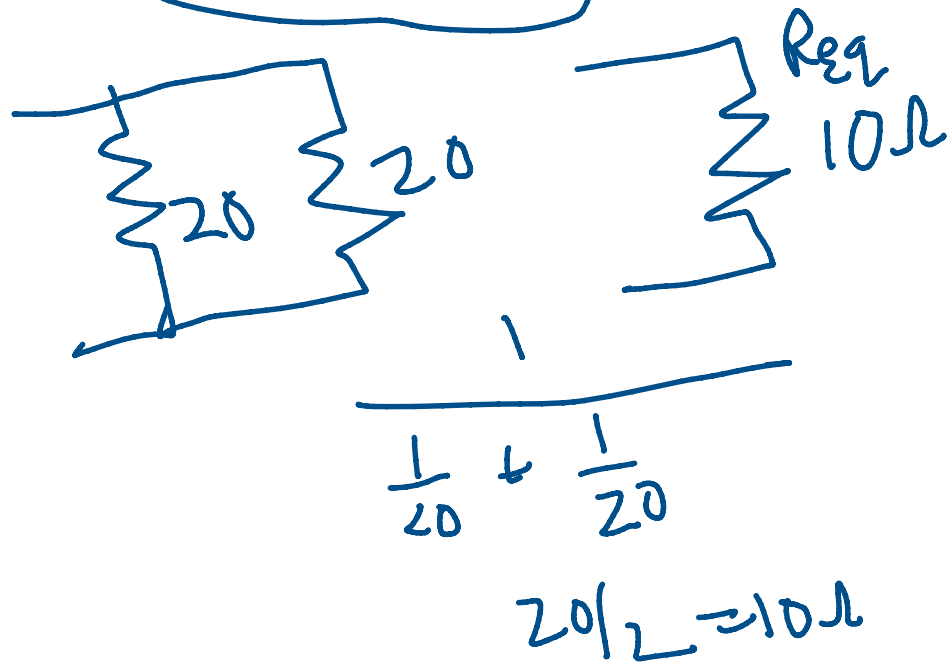
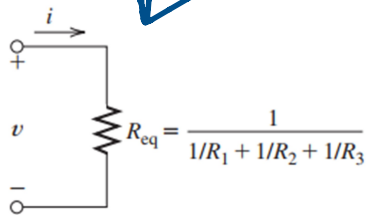
KCL Node 1

$$i = i_1 + i_2 + i_3$$

$$i = (v/R_1) + (v/R_2) + (v/R_3)$$

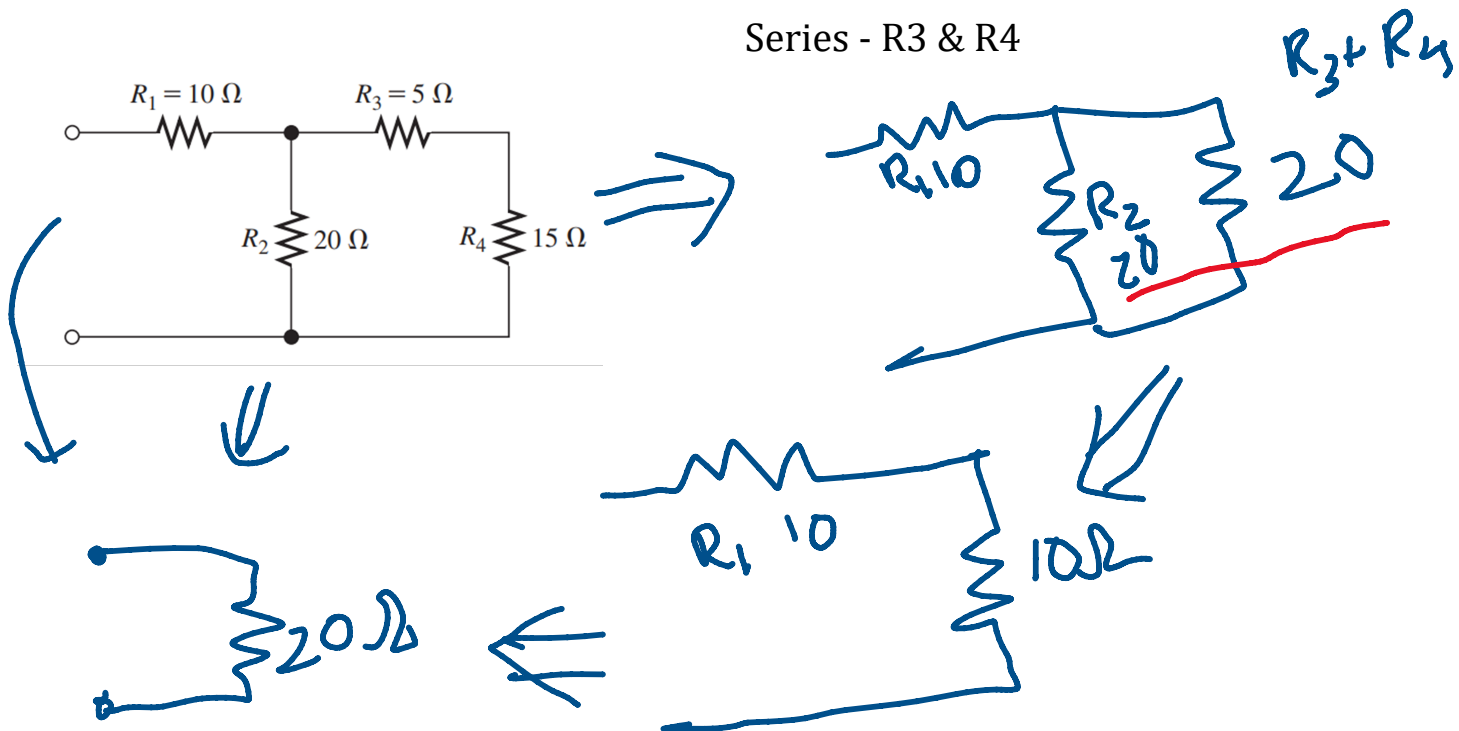
$$i = v(1/R_1 + 1/R_2 + 1/R_3)$$

$$V = I \left(\frac{1}{1/R_1 + 1/R_2 + 1/R_3} \right)$$



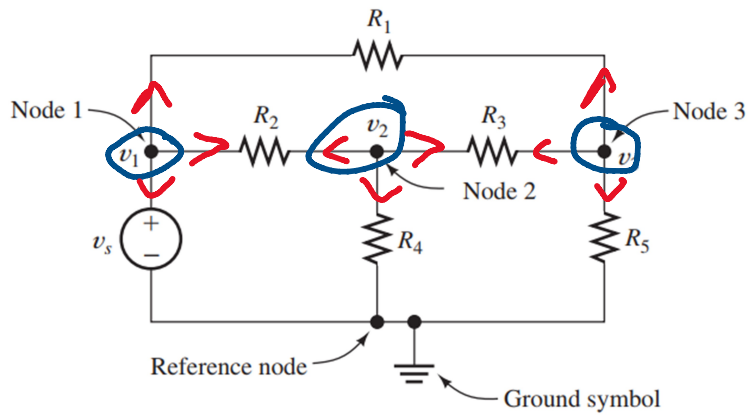
Combining Resistances in Series and Parallel

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Node-Voltage Analysis - Example 1

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Node Voltage analysis at Node1:

$$(v_1 - v_3)/R_1 + (v_1 - v_2)/R_2 = 0$$

Node 2:

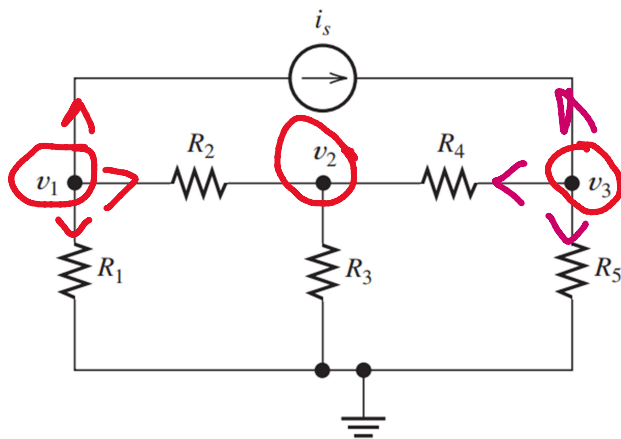
$$(v_2 - v_1)/R_2 + (v_2 - v_3)/R_3 + (v_2 - 0)/R_4 = 0$$

Node 3:

$$(v_3 - v_1)/R_1 + (v_3 - v_2)/R_3 + (v_3 - 0)/R_5 = 0$$

Example 2

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Node-Voltage analysis at Node 1

$$(v_1 - v_2)/R_2 + (v_1 - 0)/R_1 + i_s = 0$$

Node 2:

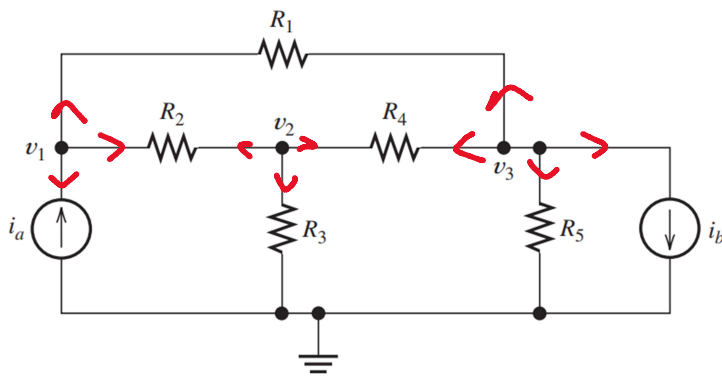
$$(v_2 - v_1)/R_2 + (v_2 - 0)/R_3 + (v_2 - v_3)/R_4 = 0$$

Node 3:

$$(v_3 - v_2)/R_4 + (v_3 - 0)/R_5 - i_s = 0$$

Example 3

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Node 1:

$$(v_1 - v_3)/R_1 + (v_1 - v_2)/R_2 - i_a = 0$$

Node 2:

$$(v_2 - v_1)/R_2 + (v_2 - v_3)/R_4 + (v_2 - 0)/R_3 = 0$$

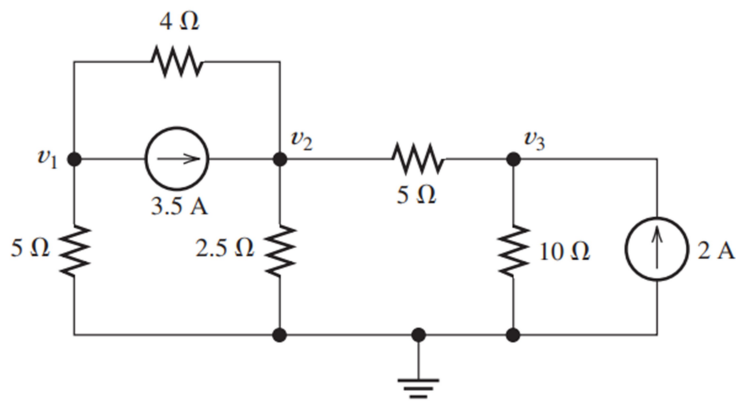
Node 3:

$$(v_3 - v_1)/R_1 + (v_3 - v_2)/R_4 + i_b + (v_3 - 0)/R_5 = 0$$

Example 4

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$$\begin{aligned} 0\ v_1 + 0\ v_2 + 0\ v_3 &= -3.5 \\ 0\ v_1 + 0\ v_2 + 0\ v_3 &= 3.5 \\ 0\ v_1 + 0\ v_2 + 0\ v_3 &= 2 \end{aligned}$$

Node 1

$$(v_1 - v_2)/4 + 3.5 + (v_1 - 0)/5 = 0$$

Node 2:

$$(v_2 - v_1)/4 - 3.5 + (v_2 - v_3)/5 + (v_2 - 0)/2.5 = 0$$

Node 3:

$$(v_3 - v_2)/5 + (v_3 - 0)/10 - 2 = 0$$

Example 5

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