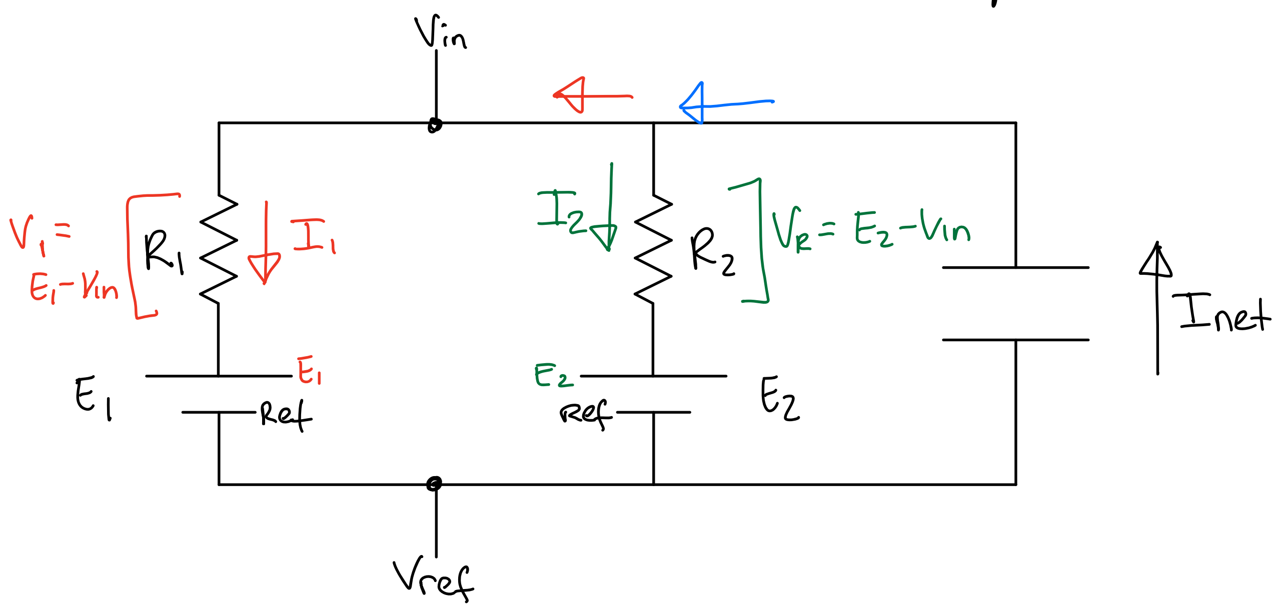
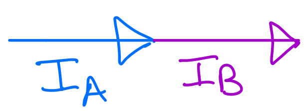
* Arrow directions are "arbitrary" (don't matter initially) BUT must then be self-consistent across equations

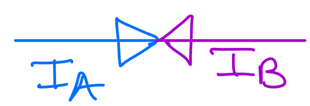


* Arrow direction for the current determines the *sign* of the current

$$I_{net} = +I_1 + I_2$$

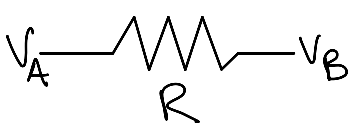
if 

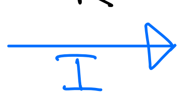
then $+I_A = +I_B$

if 

then $+I_A = -I_B$

* Sign (direction) of the current depends on the directionality of voltage (in this case across the resistor)

EX: 

if 

then, $V_B > V_A$

if 

then, $V_B < V_A$

So, if $I_{net} = +I_1 + I_2$ then $V_{R1} = E_1 - V_{in}$

and $V_{R2} = E_2 - V_{in}$

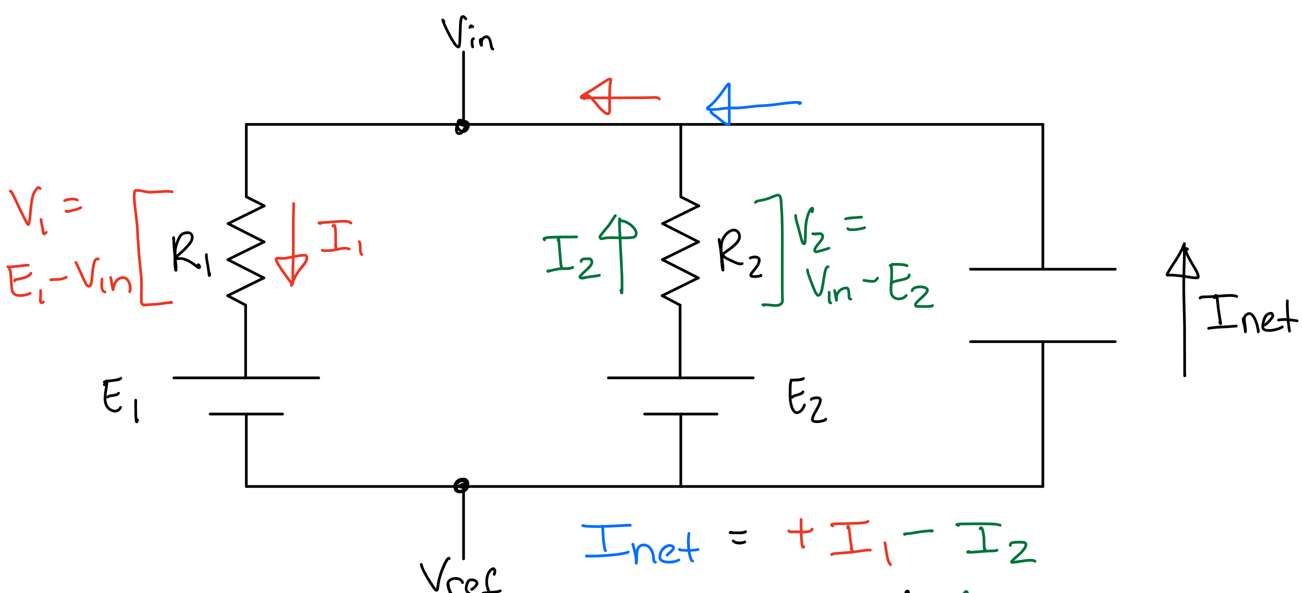
and thes equations combine to:

$$0 = +\frac{E_1 - V_{in}}{R_1} + \frac{E_2 - V_{in}}{R_2}$$

(simplifies) to $\Downarrow$

$$V_{in} = \frac{\left[E_1/R_1 + E_2/R_2\right]}{\left(1/R_1 + 1/R_2\right)}$$

* If you choose different arrow directions, all other equation "signs" must stay consistent with that arrow choice. *



$I_{net} = +I_1 - I_2$

$V_{R1} = E_1 - V_{in}$ & $V_{R2} = V_{in} - E_2$

$$0 = +\frac{E_1 - V_{in}}{R_1} - \frac{V_{in} - E_2}{R_2}$$

$\Downarrow$ * (simplifying steps)

$$V_{in} = \frac{\left[E_1/R_1 + E_2/R_2\right]}{\left(1/R_1 + 1/R_2\right)}$$

$$* \begin{cases} 0 = +\frac{E_1}{R_1} - \frac{V_{in}}{R_1} - \frac{V_{in}}{R_2} + \frac{E_2}{R_2} \\ V_{in}\left(\frac{1}{R_1} + \frac{1}{R_2}\right) = \frac{E_1}{R_1} + \frac{E_2}{R_2} \end{cases}$$