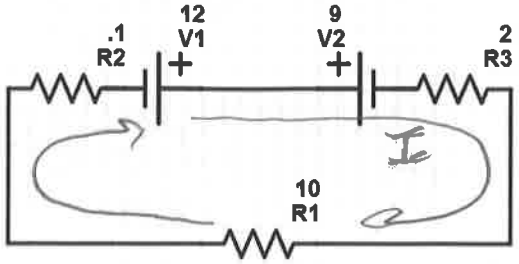
Name Solutions

Physics 200

Essex High School
April 21, 2017

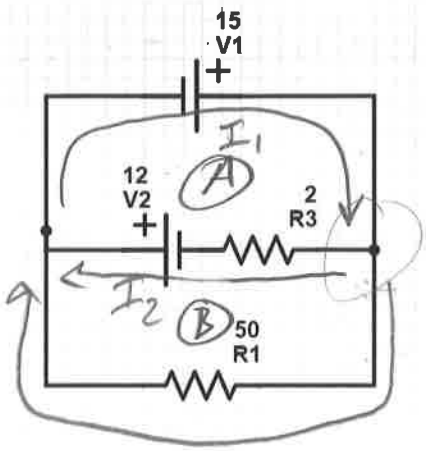
Kirchoff's Laws #1



Loop Rule: $12V - 9V - 2I - 10I - 0.1I = 0$

$3V = 12.1I$

$I = \frac{3V}{12.1\Omega} = 0.248A$



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Junction Rule:

$I_1 = I_2 + I_3$

Loop A: (Clockwise)

$15V - 2I_2 + 12V = 0$

$I_2 = \frac{27}{2} A = 13.5A$

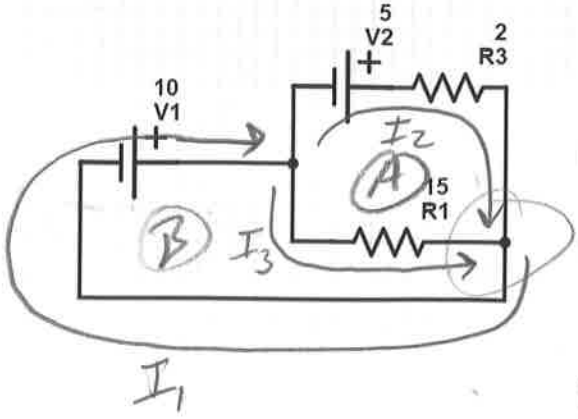
Loop B: (CCWise)

$12V + 50I_3 - 2I_2 = 0$

$50I_3 = 15V$

$I_3 = \frac{15}{50} A = 0.3A$

$I_1 = 27/2 A + \frac{15}{50} A = 13.8A$



Junction:

$I_1 = I_2 + I_3$

Loop B (cw)

$10V - 15I_3 = 0$

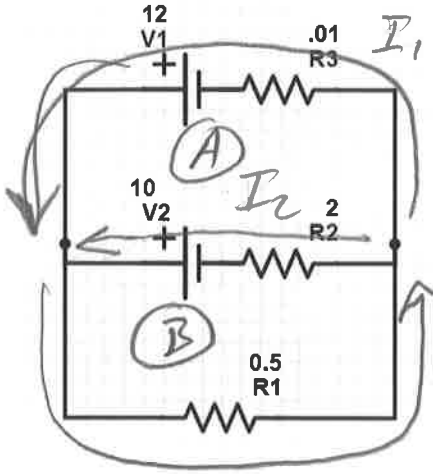
Loop A (cw)

$5V - 2I_2 + 15I_3 = 0$

$I_3 = \frac{10}{15} A = \frac{2}{3} A = 0.67 A$

$I_2 = 7.5A$

$I_1 = 8.17A$



I_1

I_2

I_3

Junction Rule

$I_1 + I_2 = I_3$

$I_2 = I_3 - I_1$

Loop A: (ccw)

$12V - 10V + 2I_2 - 0.01I_1 = 0$

$I_2 = 0.005I_1 - 1V$

Loop B: (ccw)

$10V - 0.5I_3 - 2I_2 = 0$

$I_2 = 5V - 0.25I_3$

$0.005I_1 - 1V = 5V - 0.25I_3$

$-0.02I_1 + 24V = I_3$

$0.005I_1 - 1V = -0.02I_1 + 24V - I_1$

$1.025I_1 = 25V$

$I_1 = \frac{25V}{1.025\,\Omega}$

$I_1 = 24.4A$

$I_2 = 0.005(24.4A) - 1V$

$I_2 = -0.878A$ — As drawn

$I_3 = I_1 + I_2$

$I_3 = 23.5A$

* I_2 is drawn backward! (Negative)