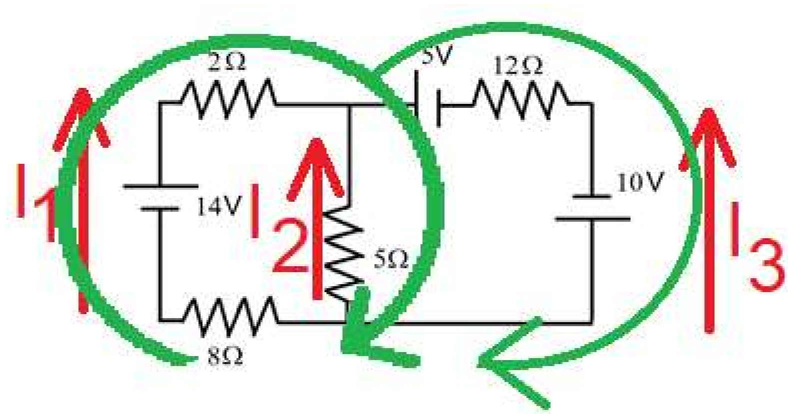
4-4)

We'll invoke Kirchhoff's rules. Label the currents in each branch and the sense of direction of each loop. I choose towards the top of the page for each current, and clockwise for each of the small loops. There are two nodes and two small loops, so we'll need one node equation and two loop equations. The 8 and 2 ohm resistors on the left branch can be combined into a single 10 ohm resistor.



$$I_1 + I_2 + I_3 = 0 \quad (1)$$

$$10I_1 - 5I_2 = +14 \quad (2)$$

$$5I_2 - 12I_3 = -5 + 10 = +5 \quad (3)$$

It is tempting to add (2) and (3) to eliminate I_2, but it would still exist in (1); bad choice. Let's multiply (1) by -10 and add it to (2):

$$-10I_1 - 10I_2 - 10I_3 = 0$$

$$10I_1 - 5I_2 = 14 \quad (2)$$

$$\overline{\hphantom{-15I_2 - 10I_3 = 14 \quad (4)}}$$

$$-15I_2 - 10I_3 = 14 \quad (4)$$

Next, let's multiply (3) by 3 and add it to (4):

$$15I_2 - 36I_3 = 15 \qquad 3 \times (3)$$

$$-15I_2 - 10I_3 = 14 \qquad (4)$$

$$\overline{\hphantom{-46I_3 = 29}}$$

$$-46I_3 = 29$$

$$I_3 = \frac{29}{-46} = -0.63\ \mathrm{A}$$

That is, the current through branch 3 flows opposite to the direction we specified as positive.

Now, we backtrack for I_2:

From (3),

$$5\mathrm{I}_2 - 12\mathrm{I}_3 = 5 \quad (3)$$

$$5\mathrm{I}_2 = 12\mathrm{I}_3 + 5$$

$$\mathrm{I}_2 = 2.4\mathrm{I}_3 + 1 = 2.4(-0.63) + 1 = -0.51\ \mathrm{A}$$

And finally, from (1),

$$\mathrm{I}_1 + \mathrm{I}_2 + \mathrm{I}_3 = 0 \quad (1)$$

$$\mathrm{I}_1 = -\mathrm{I}_2 - \mathrm{I}_3 = -(-0.51) - (-0.63) = +1.14\ \mathrm{A}$$