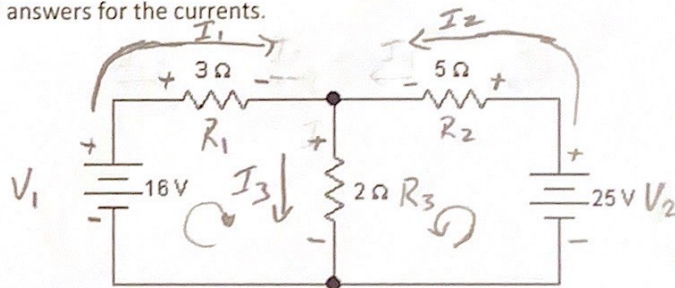


01/13/20

PHY 264 Name Sam Hemmelgarn
Quiz #1

This is a take-home quiz. You may use reference material, but you should work this quiz on your own.
Due date = Start of class on Tuesday, 18 January 2020.

Use the labels I_1 , I_2 , and I_3 for the electrical currents in the three branches of the circuit given here, and draw arrows showing the assumed directions for these currents. Also, place positive (+) and negative (-) signs on the diagram to show the high and low potential sides of each battery and each resistor. Then use Kirchhoff's voltage and current rules to write down three equations for the currents. Show all of your calculations to solve, by hand, the three simultaneous equations to determine the values for I_1 , I_2 , and I_3 . Be sure to include units for your final answers for the currents.



$$I_3 = I_1 + I_2$$

$$V_1 - I_1 R_1 - I_3 R_3 = 0$$

$$16V = 3\Omega I_1 + 2\Omega I_3 \longrightarrow 16 = 3I_1 + 2(I_1 + I_2)$$

$$16 = 3I_1 + 2I_1 + 2I_2$$

$$16 = 5I_1 + 2I_2$$

$$I_2 = 8 - \frac{5}{2}I_1$$

$$V_2 - I_2 R_2 - I_3 R_3 = 0$$

$$25V = 5\Omega I_2 + 2\Omega I_3 \longrightarrow 25 = 5I_2 + 2(I_1 + I_2)$$

$$25 = 5I_2 + 2I_1 + 2I_2$$

$$25 = 7I_2 + 2I_1$$

$$25 = 7(8 - \frac{5}{2}I_1) + 2I_1$$

$$25 = 56 - \frac{35}{2}I_1 + 2I_1$$

$$-31 = -\frac{31}{2}I_1$$

$$I_1 = \frac{62}{31} = 1.9897A$$

$$I_2 = 8 - \frac{5}{2}(1.9897A)$$

$$= 8 - 3.97436A$$

$$I_2 = 4.0256A$$

$$I_3 = 1.9897A + 4.0256A$$

$$I_3 = 6.0153A$$

$$V_1 = 16V$$

$$V_2 = 25V$$

$$R_1 = 3\Omega$$

$$R_2 = 5\Omega$$

$$R_3 = 2\Omega$$