

Linear Algebra II Project 1

Zachary Meyner

1. Confirm equation (1) and (2)

$$5I_1 + 4I_1 + 10I_1 - 10I_2 = 20 + 9 \Leftrightarrow 19I_1 - 10I_2 = 29 \quad (1)$$

$$-10I_1 + 10I_1 + 10I_1 + 10I_3 = -9 \Leftrightarrow -10I_1 + 15I_2 = -9 \quad (2)$$

- 2.

$$\begin{bmatrix} 19 & -10 & 29 \\ -10 & 15 & -9 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & \frac{69}{37} \\ 0 & 1 & \frac{119}{185} \end{bmatrix}$$

$$\text{Thus } I_1 = \frac{69}{37}, I_2 = \frac{119}{185}$$

3. Find the loop currents for the network. What is the current in the branch between A and B? What is the current in the branches between B and E?
A and B is $I_9 - I_{12} = 1.8619 - (-2.8696) = 4.7315$ in the direction of I_9 .
B and E is $I_{13} - I_{12} - I_{14} = (-1.7319) - (-2.8696) - (-0.3478) = 1.4885$ in the direction of I_{13} .
4. Suppose each power source in this circuit were replaced by a 9 volt battery. How do the loop currents change?
Many of the loop currents will increase since a lot of the loop currents have a lot less voltage going across them, meaning more current will need to be pushed through to make up for Kirchoff's law.