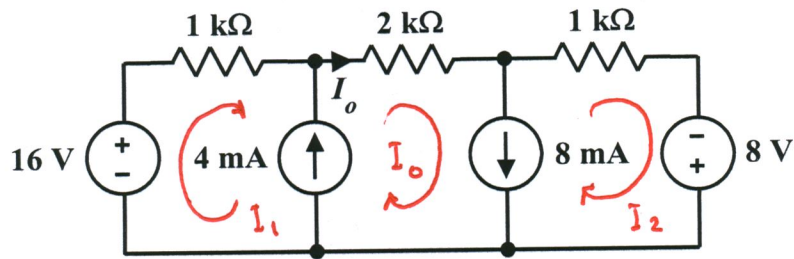a. How many equations are necessary to analyze this circuit by the mesh analysis method?

$$3$$

Use the method discussed in class to:

b. Develop the mesh equations describing the circuit.

$$I_o - I_1 = 4 mA$$

$$I_o - I_2 = 8 mA$$

$$-16V + (1k\Omega) I_1 + (2k\Omega) I_o + (1k\Omega) I_2 - 8V = 0$$

c. Write the mesh equations in the matrix form discussed in class.

$$\begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ 2000 & 1000 & 1000 \end{bmatrix} \begin{bmatrix} I_o \\ I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 0.004 \\ 0.008 \\ 24 \end{bmatrix}$$

d. Solve the mesh equations to determine the value of I_o.

$$I_o = 9 mA$$