Ex:

Use the mesh-current method to find $i_1$, $i_2$, and $i_3$.

### Solve:

For the $i_1$ loop, we have a current source on the outside edge of the circuit. Thus, $i_1 = -9 \text{A}$. (Minus sign is caused by direction of $i_1$ being opposite to the direction of the 9A.)

$$i_1 = -9 \text{A}$$

For the $i_2$ loop, we also have a current source on the outside edge of the circuit.

$$i_2 = 12 \text{A}$$

For the $i_3$ loop, we label voltage drops for $i_2$ and $i_3$, and we sum voltage drops around the $i_3$ loop.

$$-i_3 \cdot 60 \Omega + i_2 \cdot 60 \Omega - i_3 \cdot 3 \Omega + i_2 \cdot 3 \Omega - i_3 \cdot 7 \Omega = 0 \text{V}$$
we collect terms multiplying $i_2$ and $i_3$, and we put constant terms (if any) on the right side.

$$i_2 \left( 60 \Omega + 3 \Omega \right) - i_3 \left( 60 \Omega + 3 \Omega + 7 \Omega \right) = 0 \text{V}$$

Solving for $i_3$, we have

$$i_3 = -\frac{i_2 \cdot 63 \Omega}{70 \Omega} = -\frac{12 \text{A} \cdot 9}{10}$$

or

$$i_3 = -10.8 \text{ A}$$