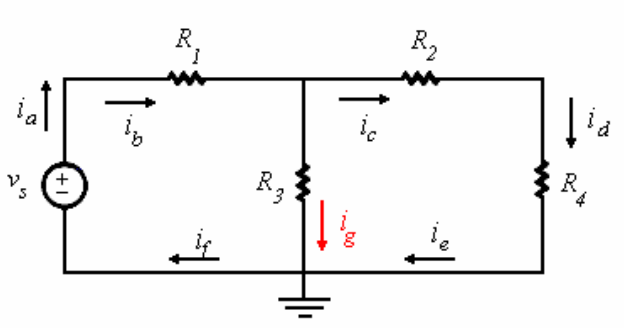
ECE 201: Linear Circuit Analysis I: Mesh Analysis

- A Mesh Current is a current that is found on the perimeter of a circuit, provided that the circuit is planar.

Example 1



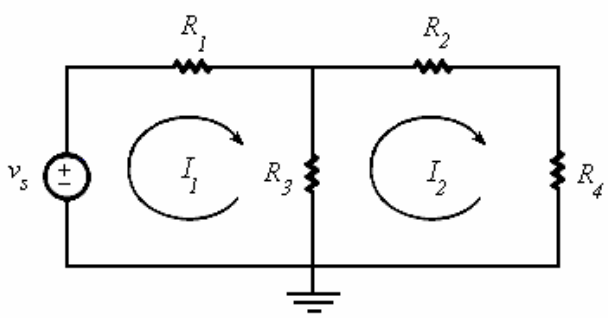
All of the currents labeled with "black" arrows are considered MESH currents. The only one that is not considered a MESH current is the current labeled with the "red" arrow.

Note the following:

1. $i_a = i_b = -i_f$ and $i_c = i_d = -i_e$
2. $i_g = i_b - i_c$

- Mesh Analysis is a technique of circuit analysis that uses a combination of Ohm's Law and KVL.

Example 2



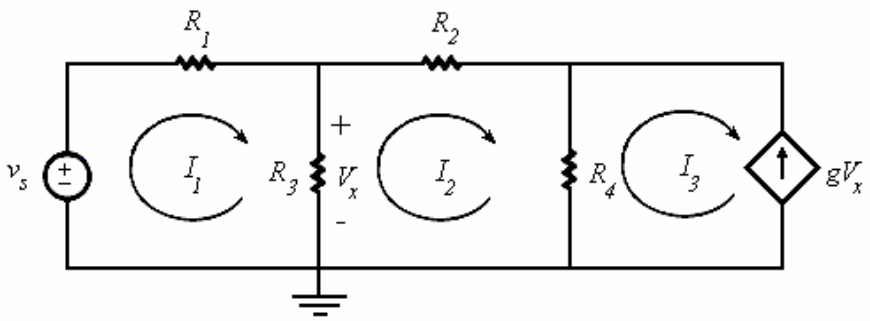
KVL

$$-v_s + I_1R_1 + (I_1 - I_2)R_3 = 0$$

Ohm's Law Ohm's Law

- If there are no current (dependent or independent) sources in the circuit, the Mesh Current method can be applied directly. (See example 2 above)
- If there are current (dependent or independent) sources on the perimeter of a circuit, then the value of the current source is the value of the mesh current for that particular loop.

Example 3



Note: *The voltage dependent current source is on the perimeter. As a result, $I_3 = -gVx$. The negative sign is due to opposite reference directions for the mesh current and the current source.*

- If there are current sources that are not on the perimeter, then use the "Super Mesh" technique. The “Super Mesh” technique says take out the current source and make a *super loop*. In that loop, do the mesh analysis, but don’t define a new mesh current variable. Just use the ones you already labeled from the beginning. Finally, relate the current source current with the two meshes that are in that branch.