**Problem 1**: Use Mesh Analysis

Given the circuit below, that $I_{S1}$, $I_{S2}$, $V_s$ and $R$'s are known.

1. Which mesh current(s) are known?
2. Which mesh current(s) are unknown?
3. Which mesh current(s) are dependent?
4. Write the equation(s) to solve the circuit by mesh analysis.
5. Box the equation(s) you would use to solve the system and list the unknowns for which you are solving.
   a. Reduce to the form of: $[R_1+R_2]i_1 + [R_3]i_2 = V_s$ (just an example)
6. Write an equation to solve for the voltage across $R_2$ in terms of mesh currents and resistors. Make sure to indicate polarity.

![Circuit Diagram]

- **KVL M2**: $R_1(i_2-i_1)+R_3i_2+V_s-V_{ES}=0$
- **KVL M3**: $R_4i_3+R_2(i_3-i_1)+V_{ES}=0$
- **KVL M2/M3 Combined**: $rac{R_1(i_2-i_1)+R_3i_2+V_s+R_4i_3+R_2(i_3-i_1)}{V_{ES}}=0$
- **Equation 1**: $(R_1+R_2)I_{S1}-V_s = (R_1+R_2)i_2 + (R_2+R_4)i_3$
- **Equation 2**: $V_{R2} = R_2(i_1-i_3)$