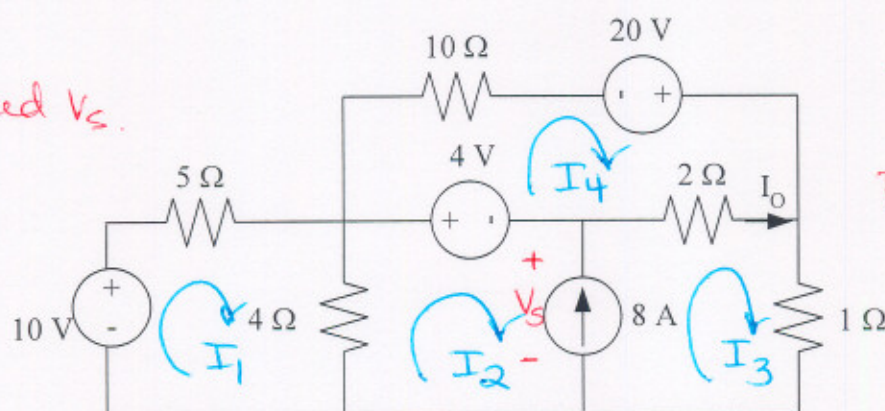Mesh Analysis Examples:

1. Use Mesh analysis to solve for the current $I_O$ and the power delivered by the 8A source.

note: I labeled $V_S$.

Know

$I_O = I_3 - I_4$

$P_{8A} = 8 \cdot V_S$

$I_3 - I_2 = 8$



m1: $10 - 5I_1 - 4(I_1 - I_2) = 0$

m2: $-4(I_2 - I_1) - 4 - V_S = 0$

m3: $V_S - 2(I_3 - I_4) - 1I_3 = 0$

m4: $-10I_4 + 20 - 2(I_4 - I_3) + 4 = 0$

Simplify

m1: $-9I_1 + 4I_2 = -10$

m2: $4I_1 - 4I_2 - V_S = 4$

m3: $-3I_3 + 2I_4 + V_S = 0$

m4: $2I_3 - 12I_4 = -24$

know: $-I_2 + I_3 = 8$

solve:

$I_1 = -0.42 A$          $I_4 = 2.76 A$

$I_2 = -3.45 A$          $V_S = 8.12 V$
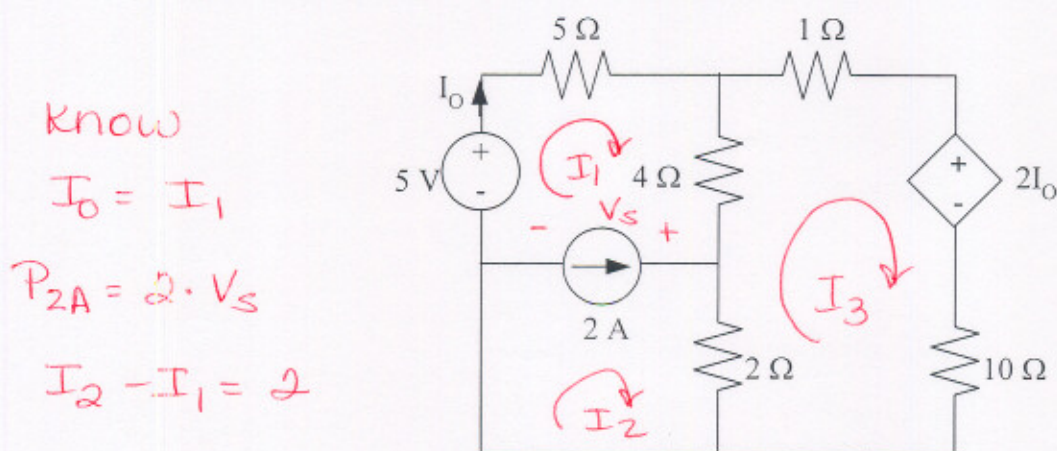
$I_3 = 4.55 A$

So:

$I_O = 1.79 A$

$P_{8A} = 64.96 W, del$

2. Use mesh analysis to find $I_O$ and the power delivered by the 2A source.



note:
I labeled
$V_S$.

know

$I_O = I_1$

$P_{2A} = 2 \cdot V_S$

$I_2 - I_1 = 2$

m1: $\quad 5 - 5I_1 - 4(I_1 - I_3) - V_S = 0$

m2: $\quad V_S - 2(I_2 - I_3) = 0$

m3: $\quad -2(I_3 - I_2) - 4(I_3 - I_1) - 1I_3 - 2I_O - 10I_3 = 0$

Simplify (remember what is known)

m1: $\quad -9I_1 + 4I_3 - V_S = -5$

m2: $\quad -2I_2 + 2I_3 + V_S = 0$

m3: $\quad 2I_1 + 2I_2 - 17I_3 = 0$

know: $\quad -I_1 + I_2 = 2$

Solve

$I_1 = 0.25A$

$I_2 = 2.25A$

$I_3 = 0.29A$

$V_S = 3.91V$

So

$I_O = 0.25A$

$P_{2A} = 7.82W, \text{del}$