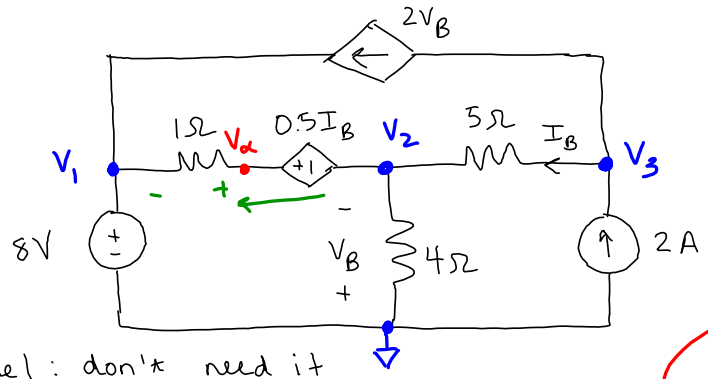


Find I_B & V_B Using Nodal Analysis

Know: $V_1 = 8V$

$V_B = -V_2$

$I_B = \frac{V_3 - V_2}{5}$

Node 1: don't need it

Node 2: $\frac{V_2 - V_3}{5} + \frac{V_2}{4} + \frac{V_2 + 0.5I_B - 8}{1} = 0$

Node 3: $2V_B + (-2) + \frac{V_3 - V_2}{5} = 0$

$V_\alpha - V_2 = 0.5 I_B$

$V_\alpha = 0.5 I_B + V_2$

$\frac{V_\alpha - V_1}{1} = \frac{V_2 + 0.5I_B - V_2}{1}$

N2: $V_2(1.35) + V_3(-0.1) = 8$

N3: $V_2(-2.2) + V_3(0.2) = 2$

$V_2 = 36V$

$V_3 = 406V$

$\Rightarrow$

$V_B = -36V$

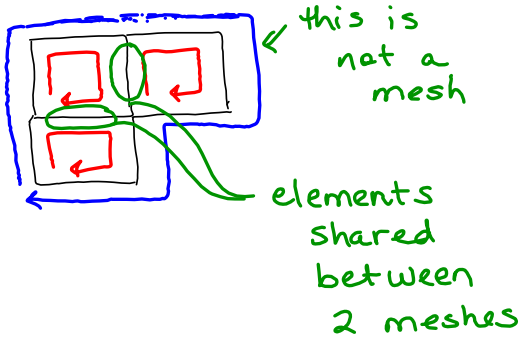
$I_B = 74A$

Mesh Analysis

Streamlined version of KVL

write KVL eqns in terms of mesh current variables.

- mesh is a loop that contains no other loops



Mesh Analysis Steps

① Identify the ckt meshes and give each mesh a mesh current variable and a loop direction.

② Write KVL equations for each mesh → mesh eqns

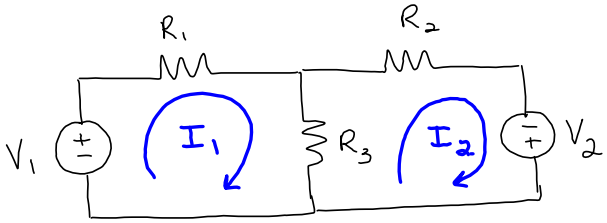
Hierarchy for writing down voltages

① Voltage source ?

② Resistor => V = IR

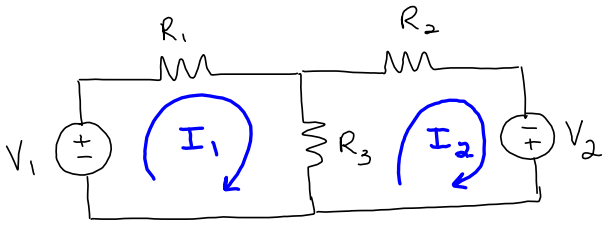
③ Label a variable / polarity

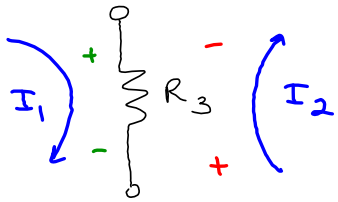
③ Solve the equations



The Rule :

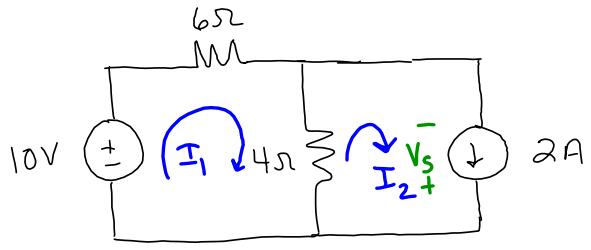
whichever mesh is being analyzed, that mesh current flows from (+) to (-) for the resistors in that mesh.





m1: $V_1 - I_1 R_1 - (I_1 - I_2) R_3 = 0$

m2: $-I_2 R_2 + V_2 - (I_2 - I_1) R_3 = 0$



Know: $I_2 = 2A$

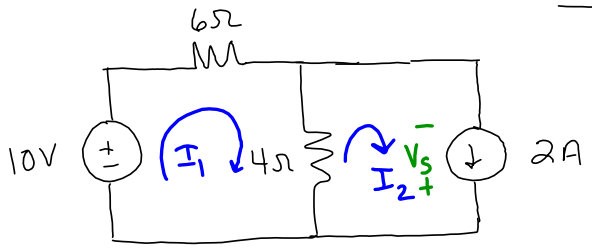
m1: $10 - 6I_1 - 4(I_1 - \cancel{I_2}^{2A}) = 0$ $\quad -10I_1 = -18$

$I_1 = 1.8\ A$

m2: Don't need

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

$V_S = 4(I_2 - I_1) = 0.8\ V$



$I_1 = 1.8A$
$I_2 = 2A$
$V_S = 0.8V$

Sources: $P = VI$

10V: $P = (10)(I_1) = 18\ W$, Del

2A: $P = V_S(2) = 1.6\ W$, Del

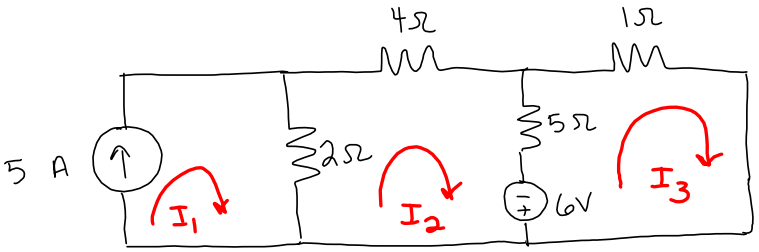
$\Sigma P_{del} = 19.6\ W$

$\Sigma P_{abs} = 19.6W$

Resistors $P = I^2R$

6Ω: $P = I_1^2(6)$
$= 19.44\ W$, Abs

4Ω $P = (I_2 - I_1)^2(4)$
$= 0.16\ W$, Abs



Find mesh currents and V_s.

Know: $*I_1 = 5A$

$V_s = 2(I_1 - I_2)$

5A

m2: $-2(I_2 - I_1) - 4I_2 - 5(I_2 - I_3) + 6 = 0$

m3: $-6 - 5(I_3 - I_2) - 1I_3 = 0$

m2: $-11I_2 + 5I_3 = -16$

m3: $5I_2 - 6I_3 = 6$

$I_2 = 1.61\ A$

$I_3 = 0.341\ A$

$V_s = 6.78\ V$