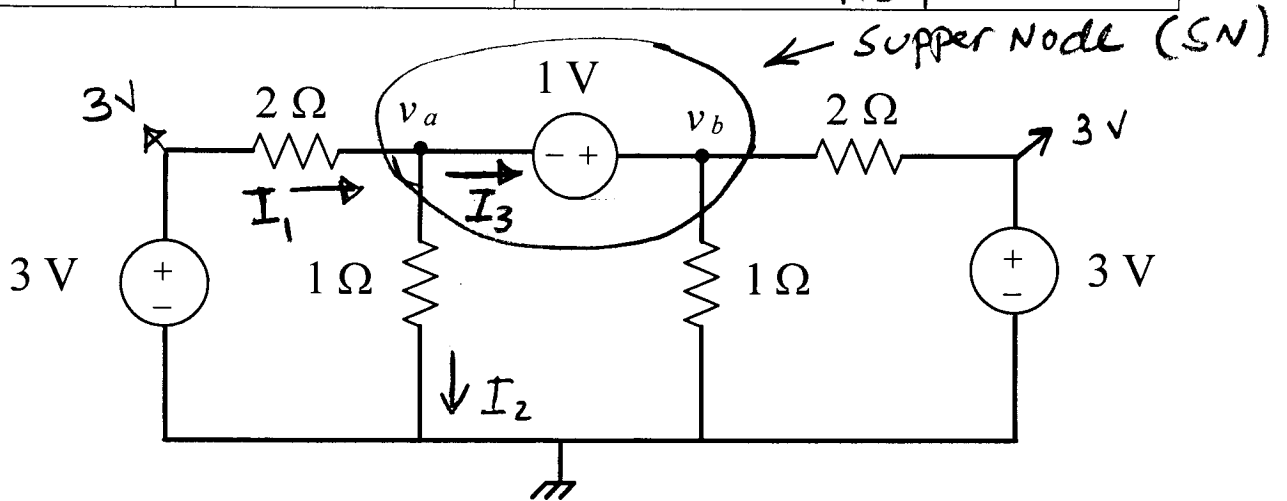| SER	ID	NAME	KEY

For the circuit shown above :

(a) Using the node voltage method find the node voltages v_a, v_b ?

(b) The power deliver by the **1 V** independent source ?

(a) KCl at SN $\dfrac{V_a - 3}{2} + \dfrac{V_a}{1} + \dfrac{V_b}{1} + \dfrac{V_b - 3}{2} = 0$

$\Rightarrow 3 V_a + 3 V_b = 6$ — ①

Voltage Restriction $V_b - V_a = 1$

or $V_a - V_b = -1$ — ②

Solving ①, ② $\Rightarrow$ $V_a = 0.5 V$ $V_b = 1.5 V$
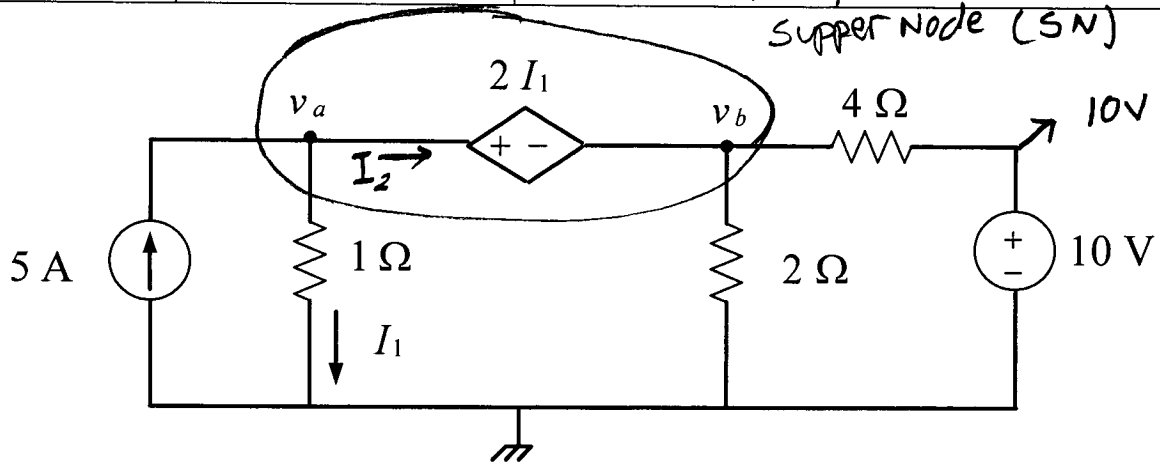
(b) $P_{1v}^{absorb} = -(1) I_3$ $\Rightarrow$ seeking I_3 ?

KCl at node V_a $I_1 = I_2 + I_3 \Rightarrow I_3 = I_1 - I_2$

$I_3 = \dfrac{3 - 0.5}{2} - \dfrac{0.5}{1} = 0.75$ A

$P_{1v}^{absorb} = -(1)(0.75) = -0.75 W \Rightarrow P_{1v}^{deliver} = 0.75 W$

SER	ID		NAME	KEY

Supper Node (SN)

For the circuit shown above :

(a) Using the node voltage method find the node voltages v_a, v_b ?

(b) The power deliver by the dependent voltage source ?

(a) $\underline{kcl\ at\ SN}$ $\dfrac{V_a}{1} - 5 + \dfrac{V_b}{2} + \dfrac{V_b - 10}{4} = 0$

$\Rightarrow \quad 4V_a + 3V_b = 30 \quad — \text{①}$

$\underline{Voltage\ Restriction}$ $V_a - V_b = 2I_1 = 2\dfrac{V_a}{1}$

$\Rightarrow V_a + V_b = 0 \quad — \text{②}$

$solving\ \text{①},\text{②} \Rightarrow V_a = 30\ V \qquad V_b = -30V$

(b) $P_{2I_1}^{absorb} = (2I_1)I_2 \qquad seeking\ I_1, I_2 ?$

$I_1 = \dfrac{V_a}{1} = \dfrac{30}{1} = 30\ A \qquad I_2 = 5 - I_1 = -25A$

$P_{2I_1}^{absorb} = (2(30))(-25) = -1500\ W$

$\Rightarrow P_{2I_1}^{deliver} = 1500\ W$