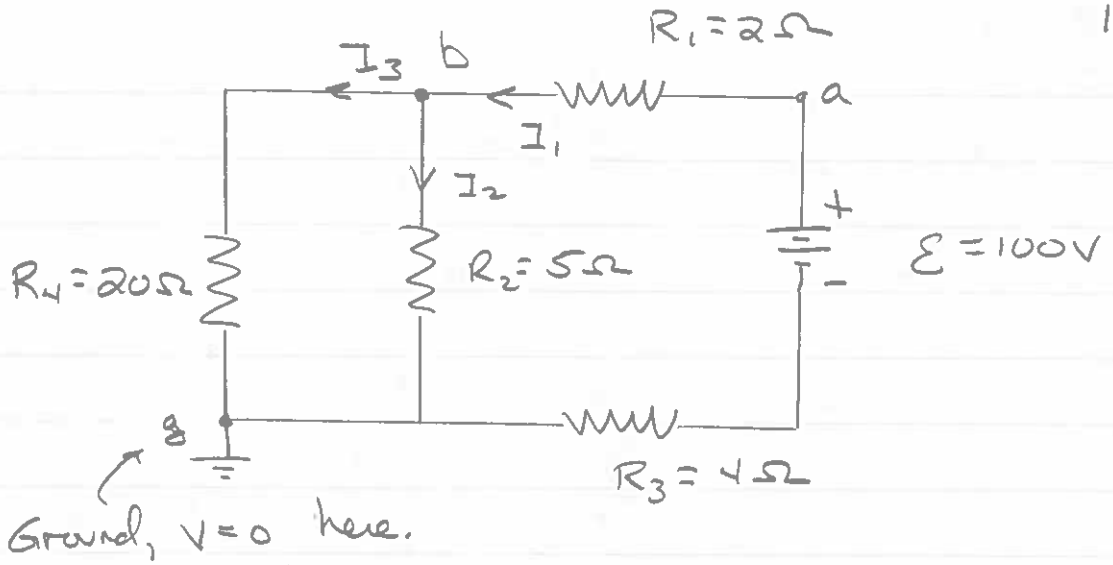

Need to find I_1, I_2 & I_3

Junction at b: $\Sigma I_{in} = \Sigma I_{out}$

$$I_1 = I_2 + I_3 \qquad (1)$$

Loop Eqn ↶ from b (outer)

$$-I_3 R_4 - I_1 R_3 + \mathcal{E} - I_1 R_1 = 0 \qquad (2)$$

Loop Eqn ↶ from b (left)

$$-I_3 R_4 + I_2 R_2 = 0 \qquad (3)$$

Subst. (1) → (2):

$$-I_3 R_4 - (I_2 + I_3) R_3 + \mathcal{E} - (I_2 + I_3) R_1 = 0$$
$$-I_3 R_4 - I_2 R_3 - I_3 R_3 - I_2 R_1 - I_3 R_1 + \mathcal{E} = 0$$

or

$$-I_2 (R_3 + R_1) - I_3 (R_4 + R_3 + R_1) + \mathcal{E} = 0$$
$$-6 I_2 - 26 I_3 + 100 = 0 \qquad (4)$$

Now: equ'n (3) is:

$$-20I_3 + 5I_2 = 0 \qquad (5)$$

and (4) $$26I_3 + 6I_2 = 100 \qquad (6)$$

(5) → $$I_2 = \frac{20}{5} I_3 = 4I_3$$

→ (6)

$$26I_3 + 6(4I_3) = 100$$

$$50I_3 = 100$$

$$\therefore \quad \underline{I_3 = 2\,A}$$

Now: $$\underline{I_2 = 4I_3 = 8A}$$

and $$\underline{I_1 = I_2 + I_3 = 10\,A}$$

a) $I_1 = 10\,A$ through $2\,\Omega$ resistor