

HW 2 Solution Corrections

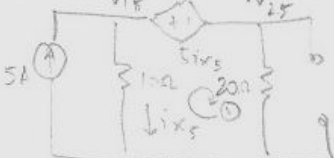
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HW2, Problem 2.47

P 2.47 (using superposition)

From the 5A source:



Using Mesh:

$$5i_{x5} + 20i_1 + 10(i_1 - 5) = 0 \quad \text{where } i_{x5} = 5 - i_1$$

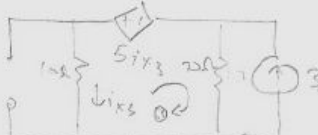
$$25 - 5i_1 + 20i_1 + 10i_1 - 50 = 0$$

$$i_1 = 1A$$

$$V_{1,5} = (5 - i_1)10 = 40V$$

$$V_{2,5} = 20i_1 = 20V$$

From the 3A source:



Using Mesh:

$$5i_{x3} + 20(i_1 + 3) + 10i_1 = 0 \quad \text{where } i_{x3} = -i_1$$

$$-5i_1 + 20i_1 + 60 + 10i_1 = 0$$

$$i_1 = -2.4A$$

Let $V1 = V1,5$; $V2 = V2,5$

For the circuit on top,

$$\frac{V1}{10} = (5 - 1)$$

$$V1 = 40V$$

For the circuit at the bottom,

$$\frac{V1}{10} = 2.4$$

$$V1 = 24V$$

Overall,

$$\boxed{V1 = 40V + 24V = 64V}$$

For the circuit on top,

$$\frac{V2}{20} = 1$$

$$V2 = 20V$$

For the circuit at the bottom,

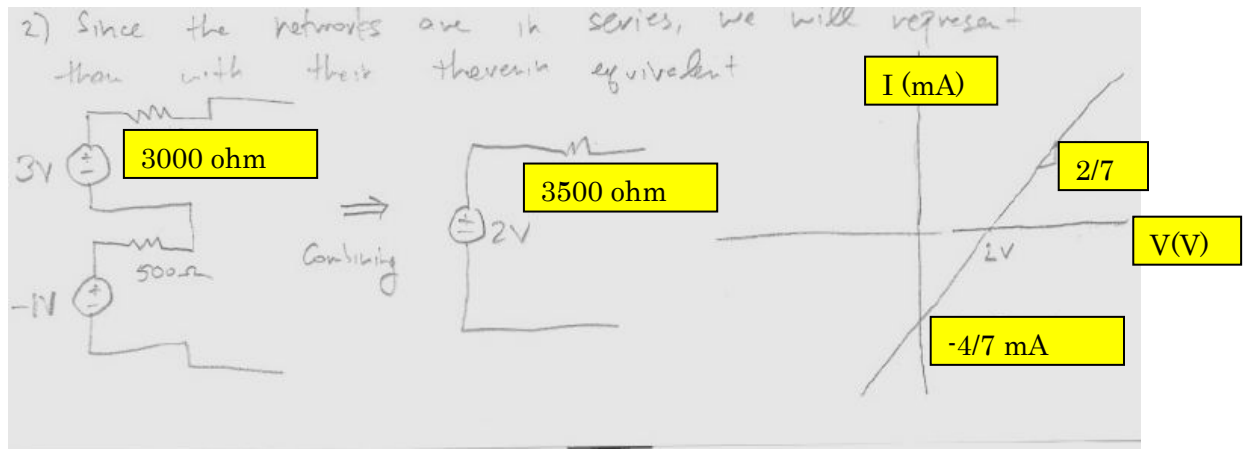
$$\frac{V2}{20} = 0.6$$

$$V2 = 12V$$

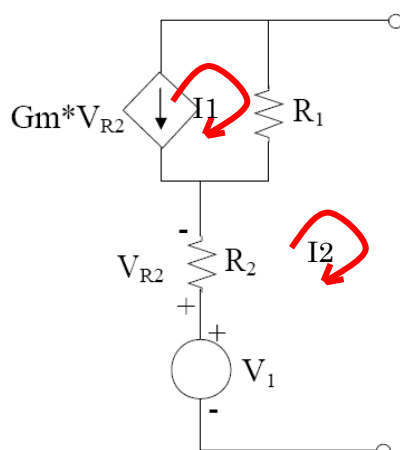
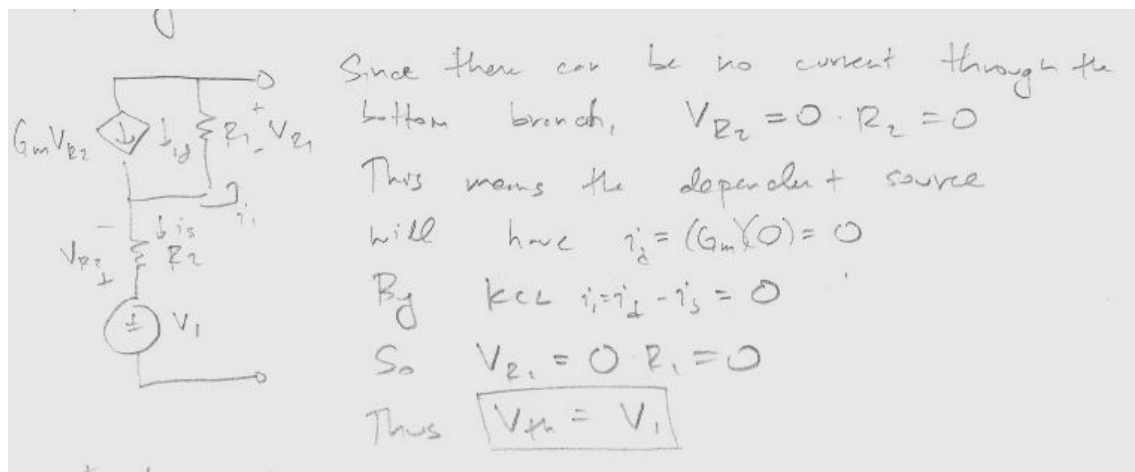
Overall,

$$\boxed{V2 = 20V + 12V = 32V}$$

HW2, Problem 2



HW2, Problem 3



Since

$$I_1 = -G_m \cdot V_{R2}$$

$$V_{R2} = I_{sc} \cdot R_2$$

$$V_{R2} + R_1(I_2 - I_1) - V_1 = 0$$

$$V_{R2} + R_1(I_{sc} + G_m \cdot V_{R2}) - V_1 = 0$$

$$I_{sc} \cdot R_2 + R_1(I_{sc} + G_m \cdot I_{sc} \cdot R_2) - V_1 = 0$$

$$I_{sc} \cdot R_2 + I_{sc} \cdot R_1(1 + G_m \cdot R_2) - V_1 = 0$$

$$I_{sc} \cdot (R_1 + R_2 + G_m \cdot R_1 \cdot R_2) = V_1$$

$$I_{sc} = \frac{V_1}{(R_1 + R_2 + G_m \cdot R_1 \cdot R_2)}$$

$$R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{V_1}{\frac{V_1}{(R_1 + R_2 + Gm \cdot R_1 \cdot R_2)}} = R_1 + R_2 + Gm \cdot R_1 \cdot R_2$$

