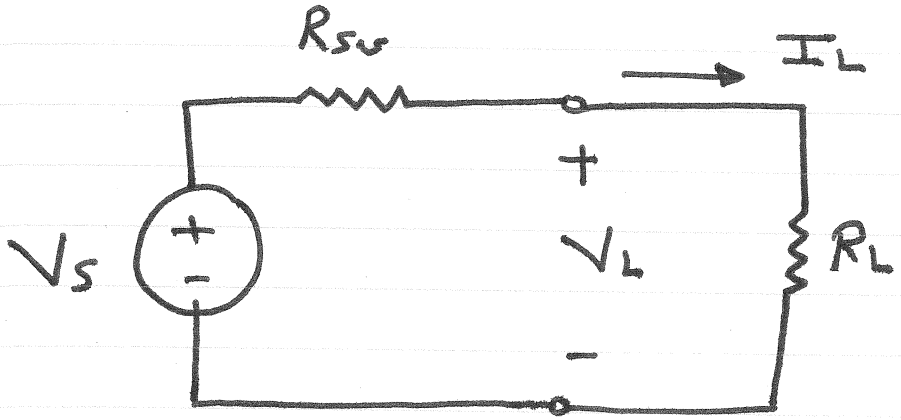
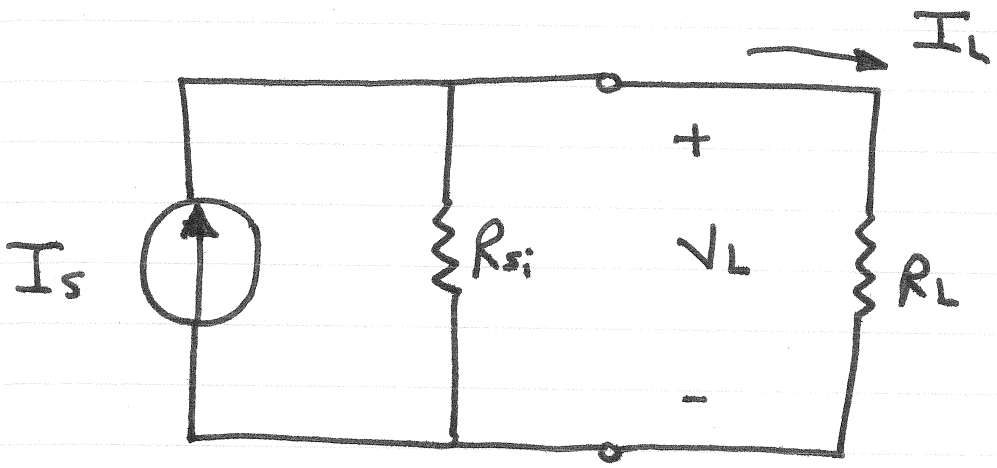
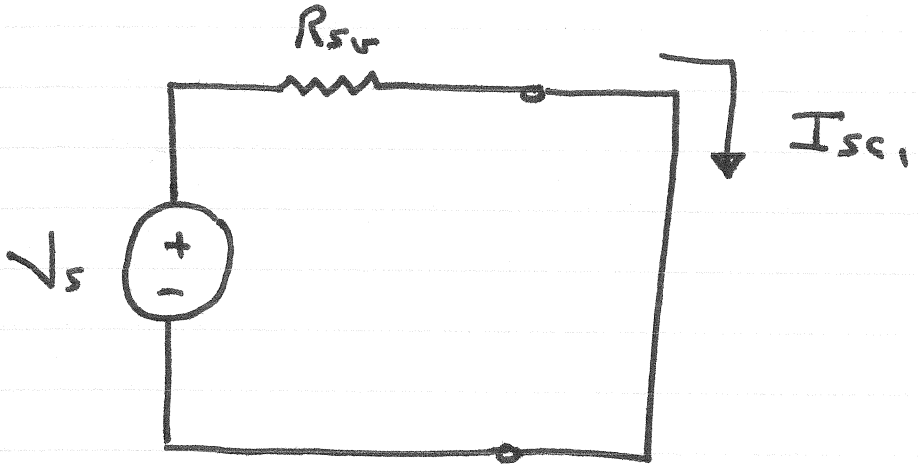
Source Transformation



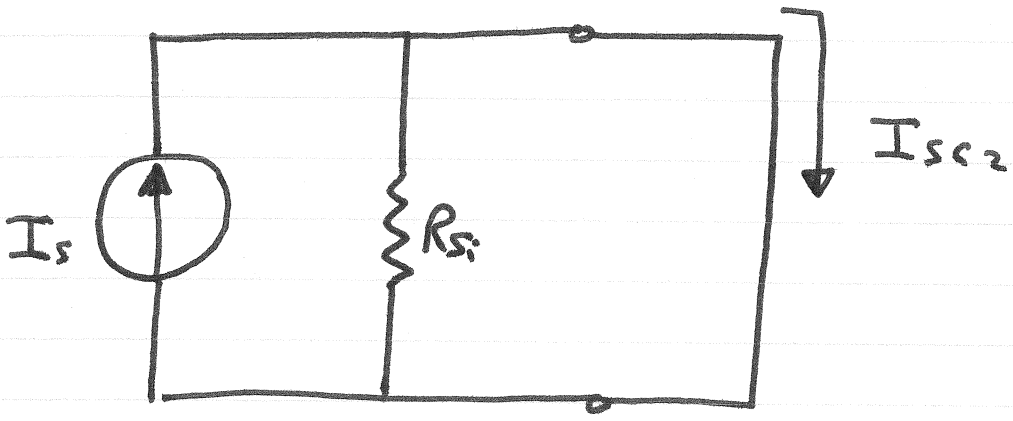


Two sources are equivalent, if each produces identical current and identical voltage in any load which is placed across its terminal.

1) let $R_L = 0$ (short circuit)



$$I_{sc_1} = \frac{V_s}{R_{sv}}$$

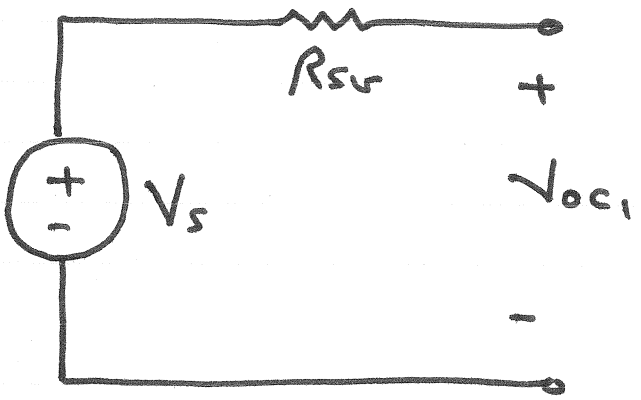


$$I_{sc_2} = I_s$$

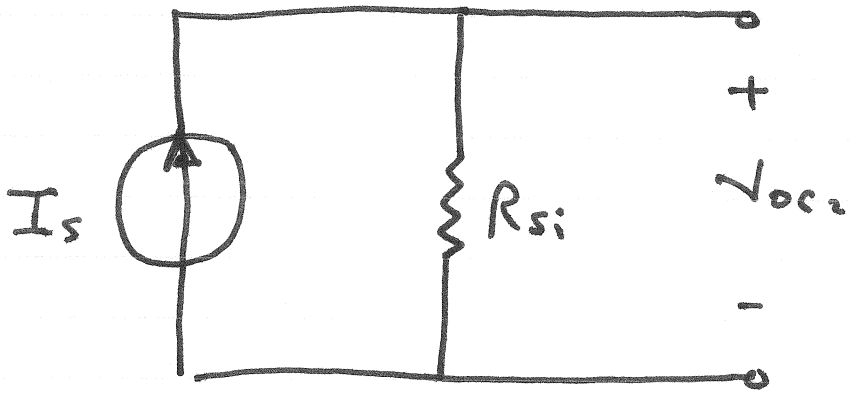
For $I_{sc_1} = I_{sc_2}$

$$\frac{V_s}{R_{sv}} = I_s \qquad \text{——— (1)}$$

2) Let $R_L = \infty$ (open circuit)



$$V_{oc_1} = V_s$$



$$V_{oc_2} = I_s R_{Si}$$

For $V_{oc_1} = V_{oc_2}$

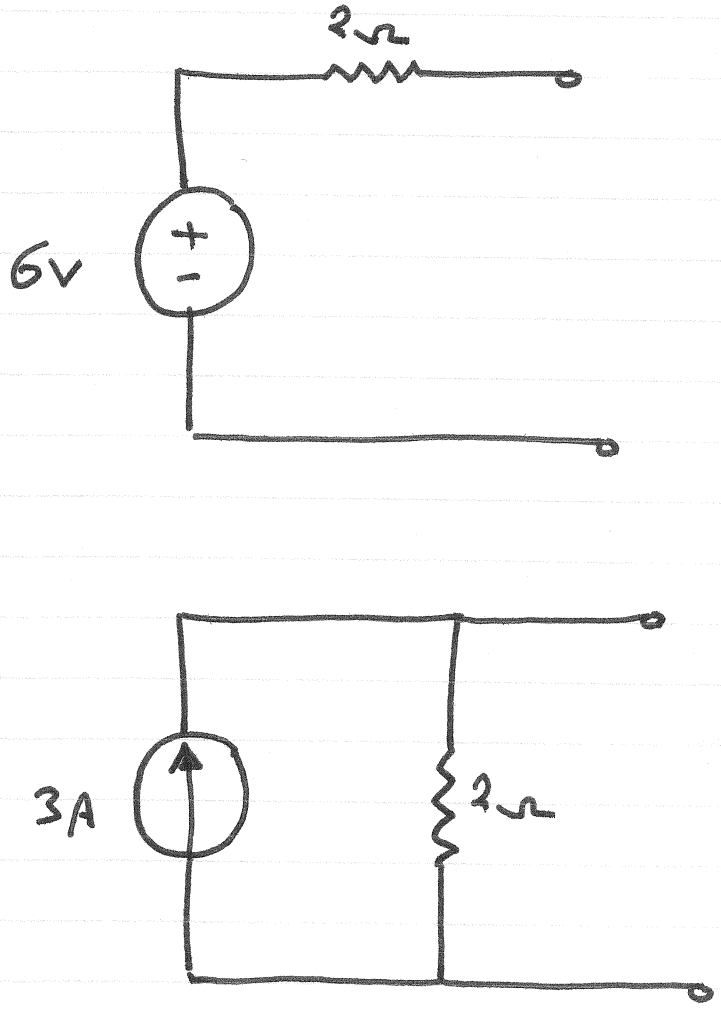
$$\boxed{V_s = I_s R_{Si}} \quad \text{— (2)}$$

$$V_s = I_s R_{si}$$

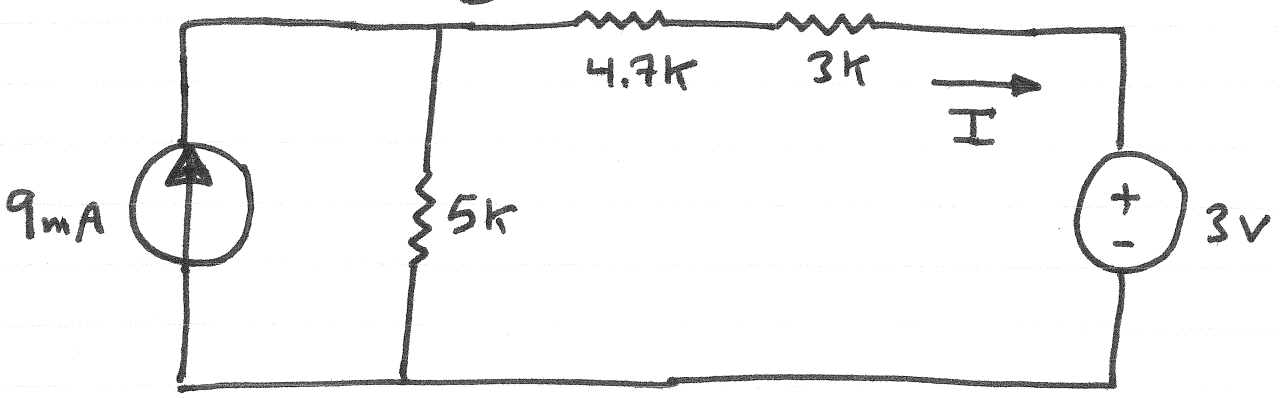
using equation ①, we get

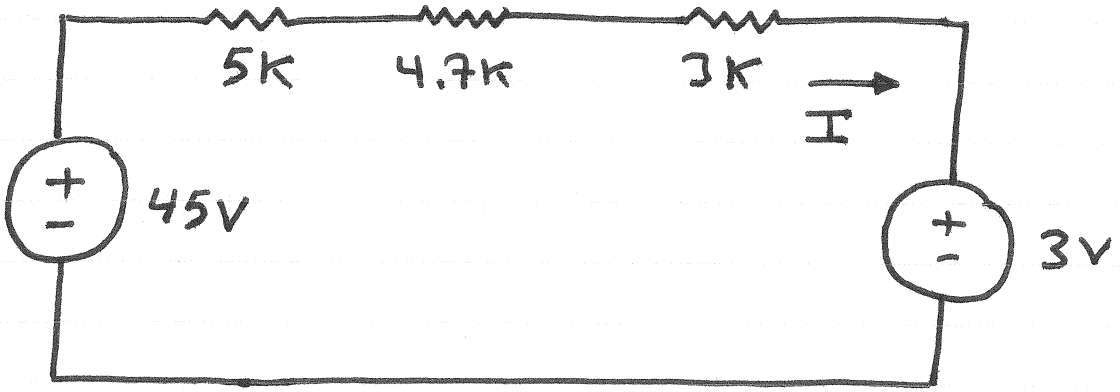
$$V_s = I_s R_{sv}$$

$$\therefore \quad R_{si} = R_{sv}$$



Find I using source transformation

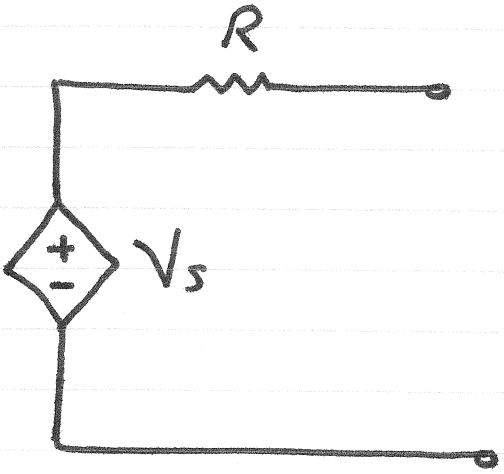


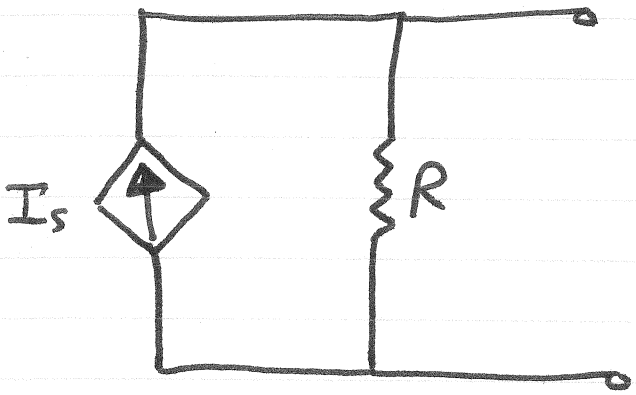


$$I = \frac{45-3}{5k+4.7k+3k} = 3.3\ mA$$

Source Transformation

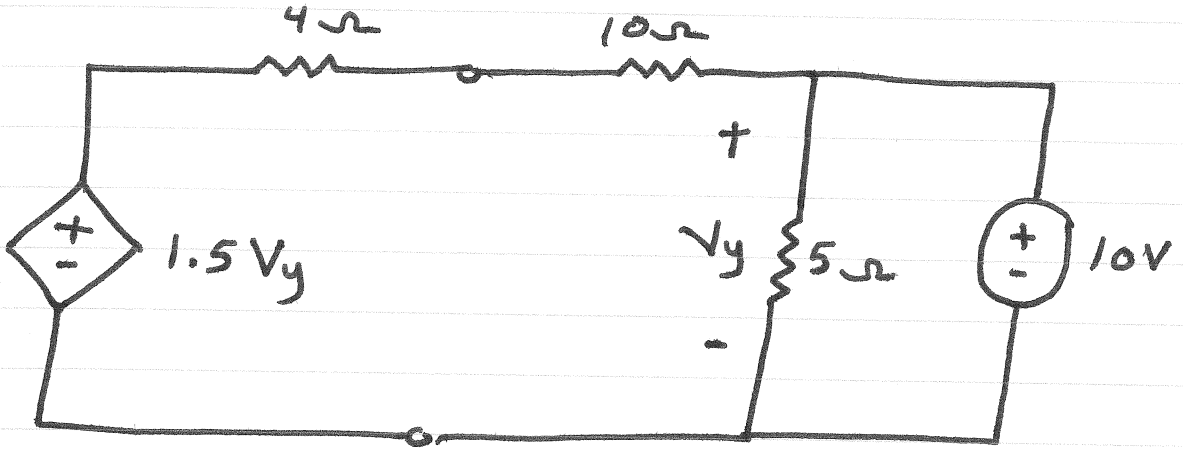
Dependent Sources

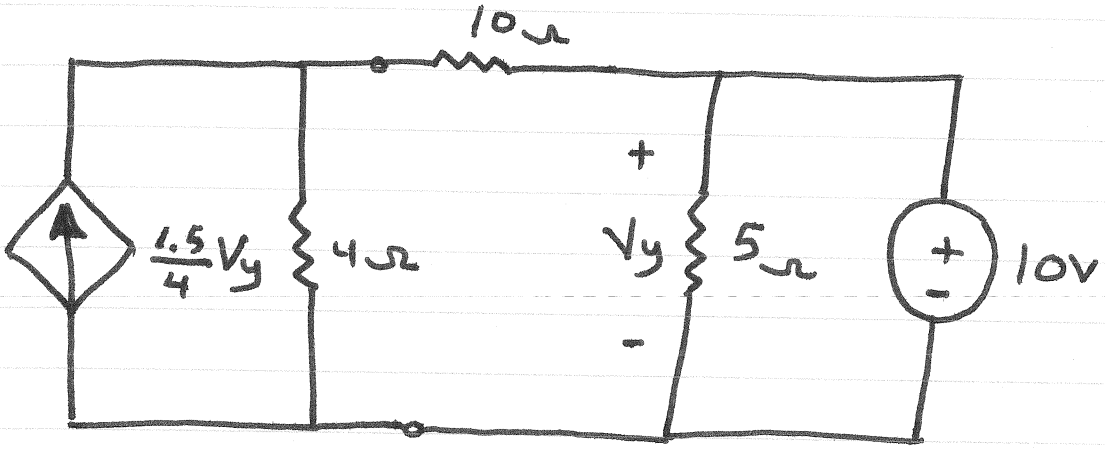




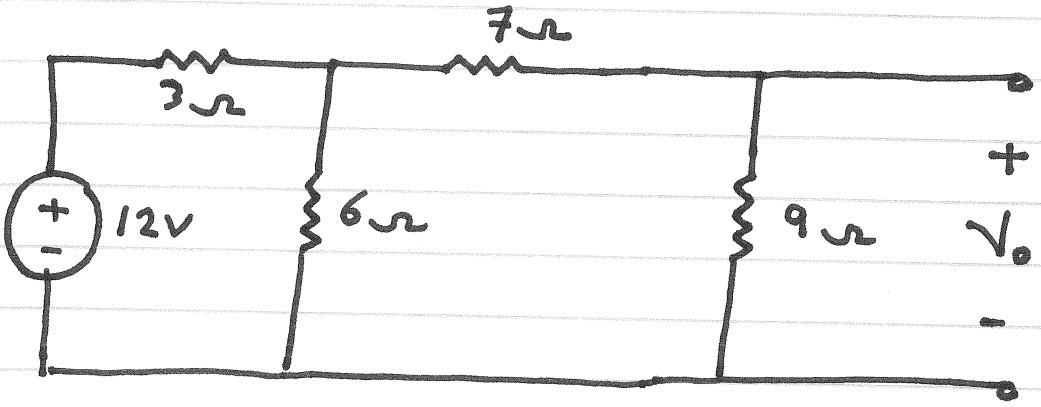
$$I_s = \frac{V_s}{R}$$

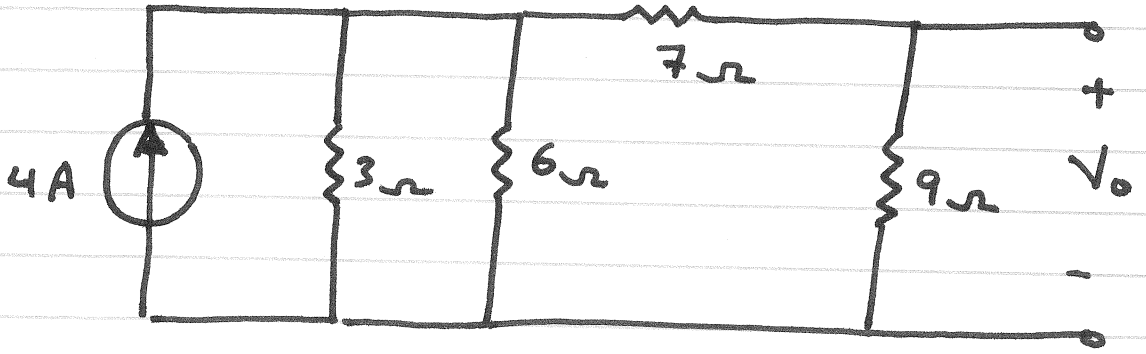
The Control Variable must be outside the transformation.

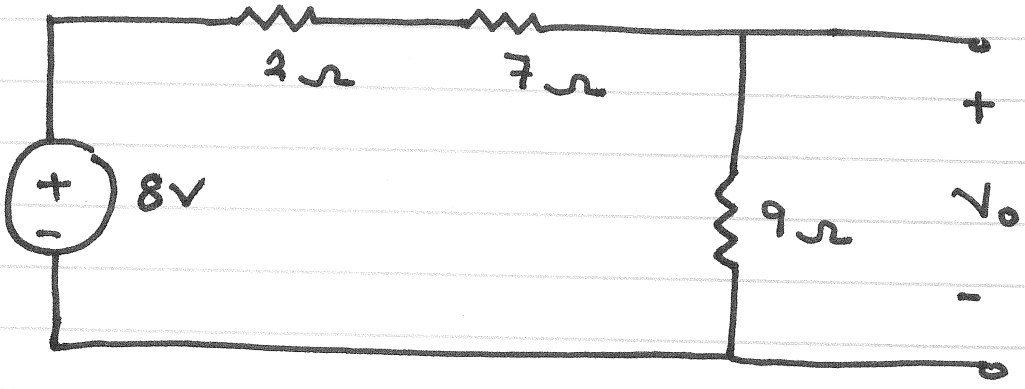


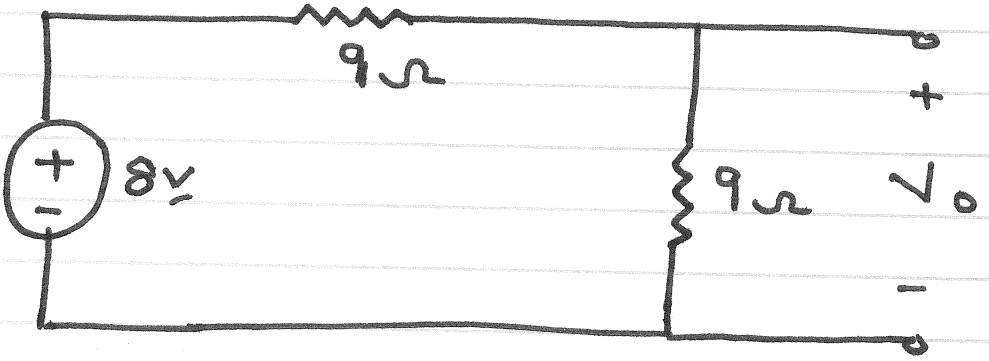


Find V_o using source transformation









$$V_o = \frac{9}{9+9} \cdot 8V = 4V$$