a. The variable resistor (R_o) in the circuit is adjusted until the power dissipated in the resistor is 100 W. Find the values of R_o that satisfy this condition (use Thevenin equivalent with respect to the terminals R_o).

b. Find the maximum power.

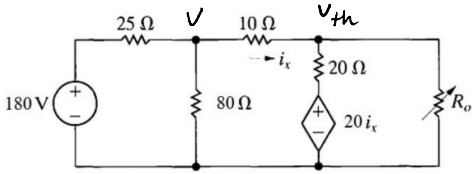
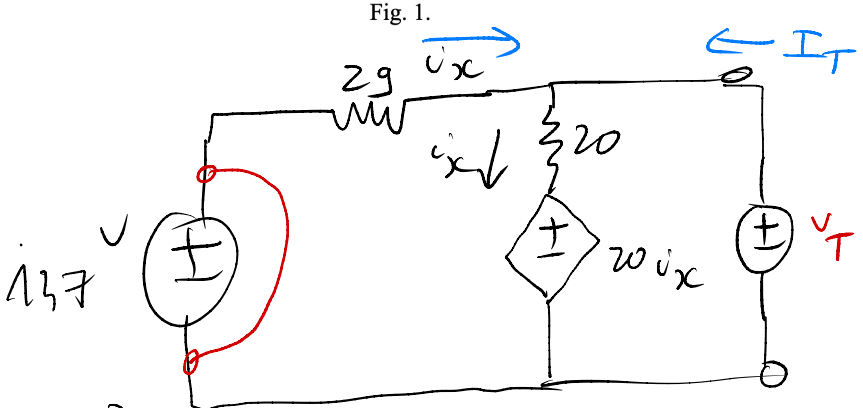


Fig. 1.



a) $i_x = \frac{137 - 20 i_x}{49} \rightarrow i_x = 1.99\ A$

$V_{th} = 20 i_x + 20 i_x = 79.6\ V$

b) $I_T = \frac{V_T}{29} + \frac{V_T - 20\left(-\frac{V_T}{29}\right)}{20}$

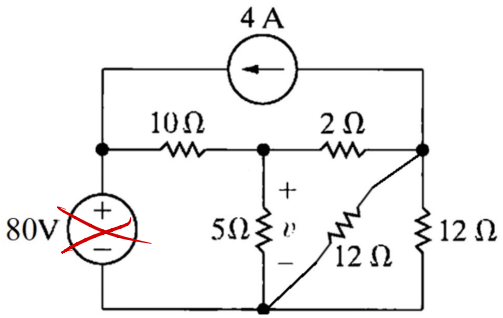
$\therefore \frac{I_T}{V_T} = \frac{69}{580} \rightarrow R_{th} = 8.4$

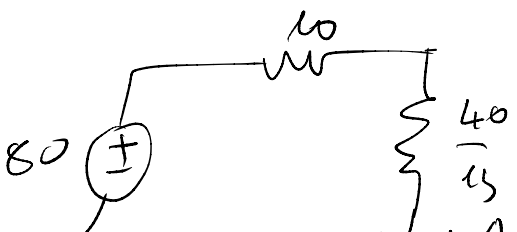
c) $P = R_o \left(\frac{V_{th}}{R_{th} + R_o} \right)^2 = 100$

Problem 2: Consider the circuit in Fig. 2,

a. Use the principle of superposition to find the voltage v in the circuit.

b. Find the power dissipated in the 5Ω resistor.

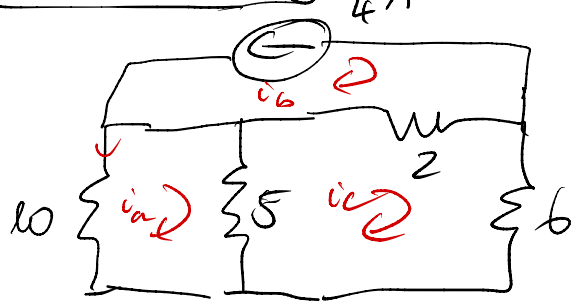




$$v = \frac{4 \times 5}{10 + 4 \times 5} \times 80 = 18.82\ V$$

$$R_{eq} = \frac{40}{17}\ \Omega$$

b)

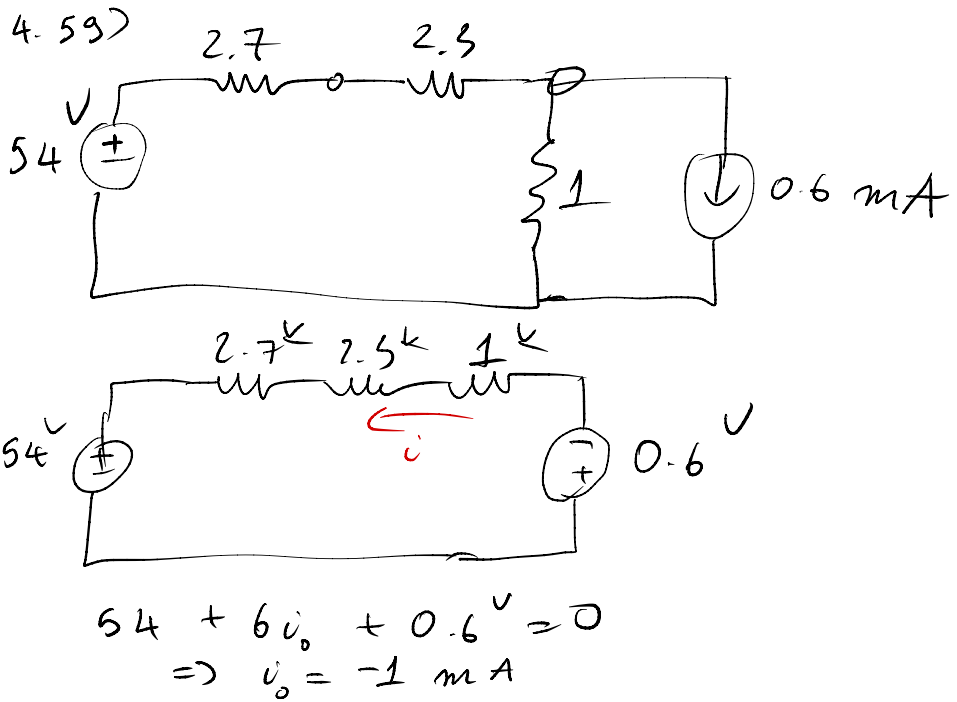


$$10(i_a + 4) + 5(i_a - i_c) = 0$$

$$5(i_c - i_a) + 2(i_c + 4) + 6i_c = 0$$

$$\begin{cases} i_a = -2.5 \\ i_c = -1.88 \end{cases} \Rightarrow v'' = -7.5\ V$$

$$\rightarrow v = 11.72\ V$$



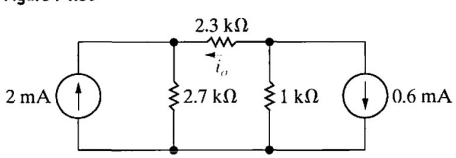
Section 4.9

4.59 PSPICE MULTISIM

a) Use a series of source transformations to find the current i_o in the circuit in Fig. P4.59.

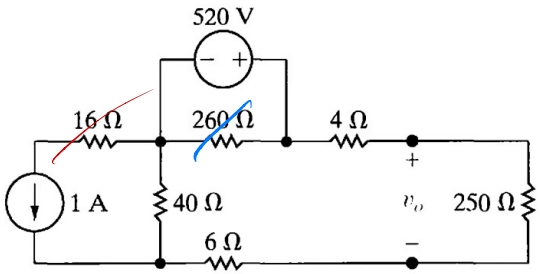
b) Verify your solution by using the node-voltage method to find i_o.

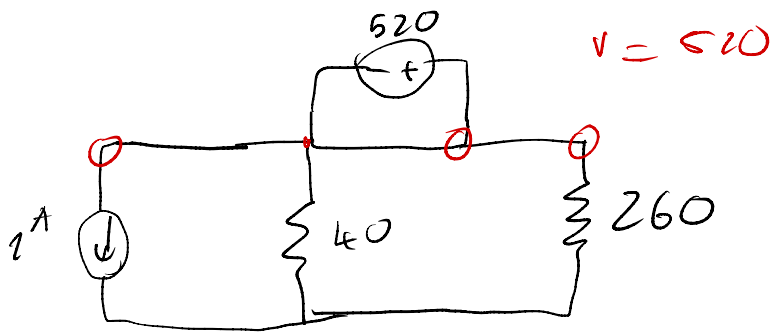
Figure P4.59



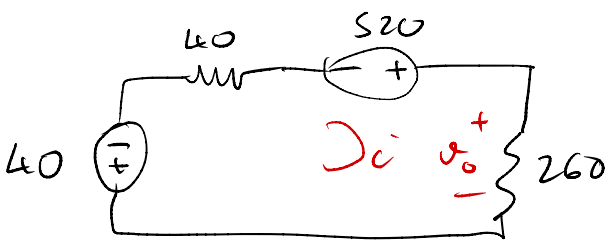
4.62

Figure P4.62





V = 520



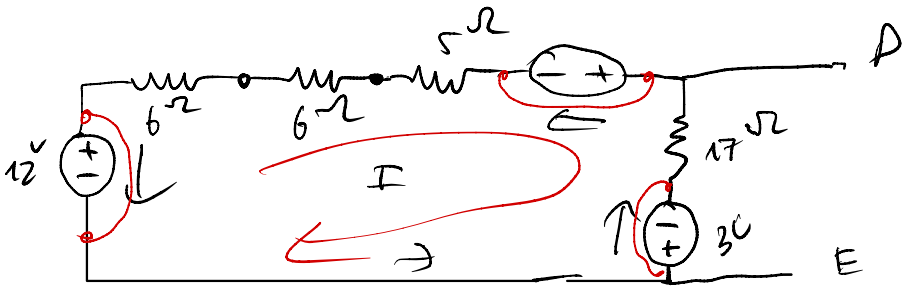
$40 - 520 + 300i = 0$

$\rightarrow i = 1.6\ A$

$v_o = 1.6 \times 250 = 400\ V$

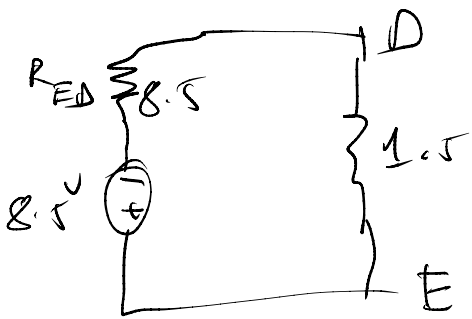
c) $P_{1A} = 1 \times 520 = 520\ W$

4.61

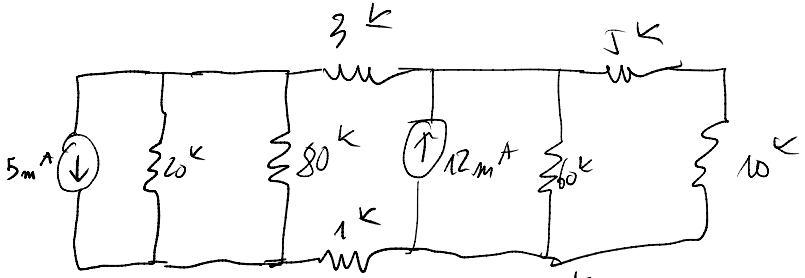


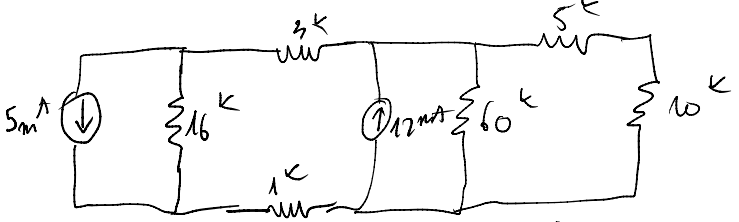
$$I = \frac{-12 - 5 - 34}{34} = -1.5\ A$$

$$R_{ED} = (6+6+5) \parallel 17 = 8.5\ \Omega$$



$$\rightarrow I_0 = \frac{-8.5}{10} = -0.85\ A$$





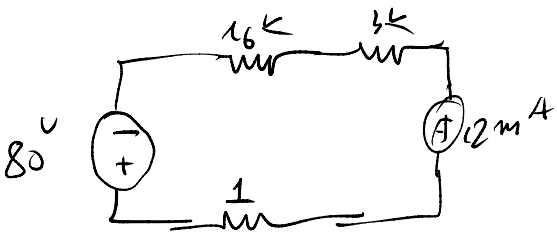
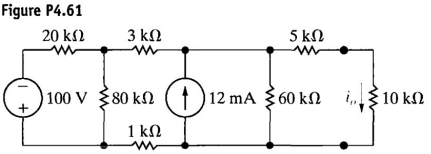
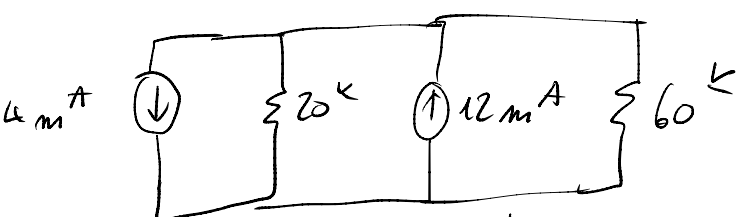
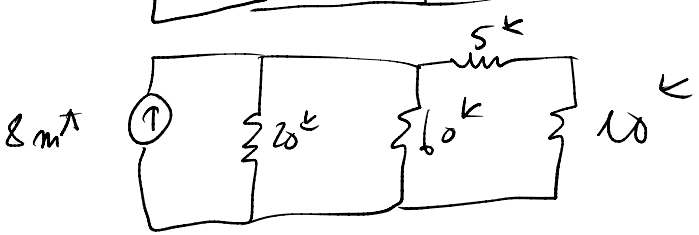
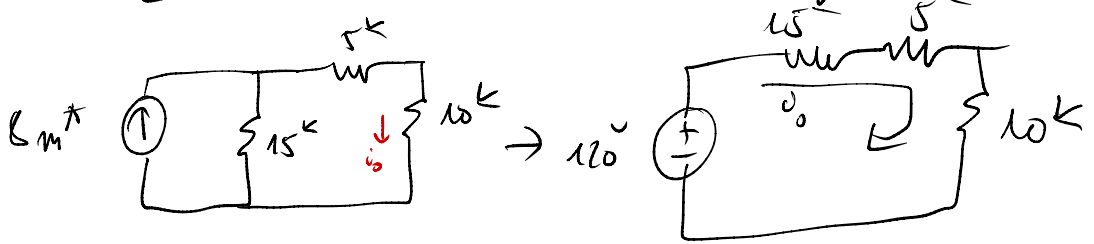


Figure P4.61

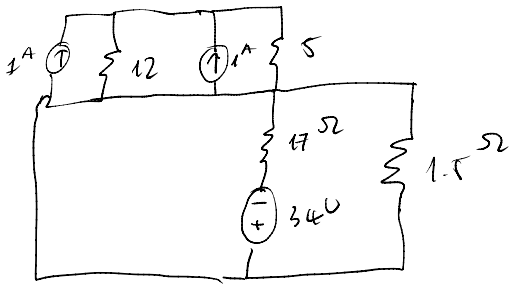


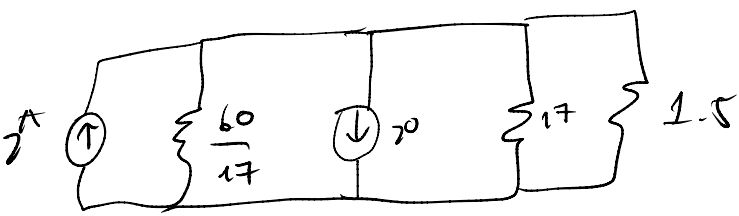


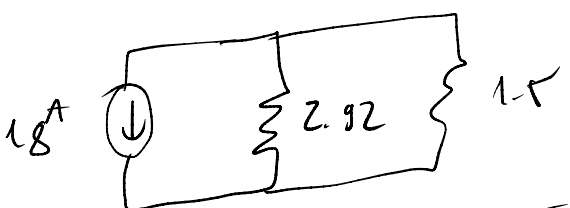


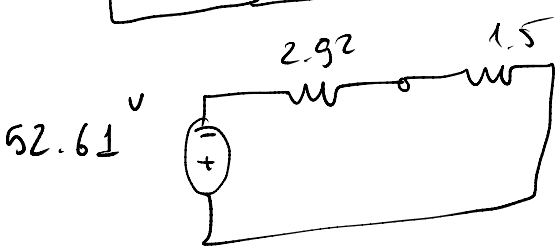


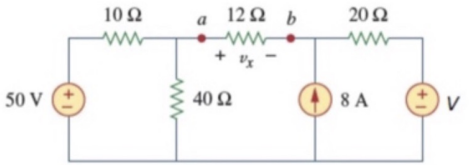
$$v_o = \frac{120}{30k} = 4\,mA$$


1A
12
1A
5
17Ω
1.5Ω
34V

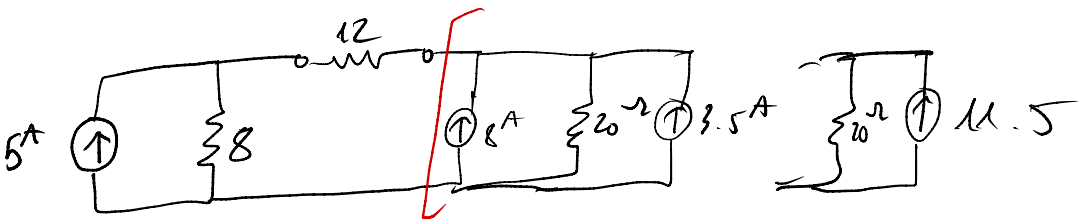

1A
60/17
20
17
1.5

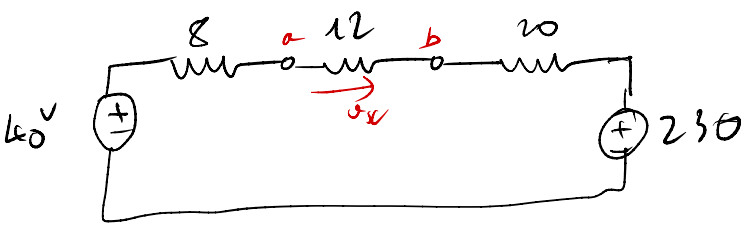

18A
2.92
1.5


2.92
1.5
52.61V



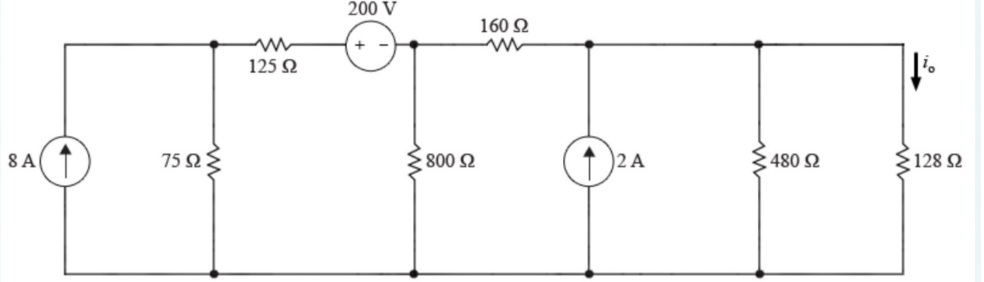
The value of v_x in the given circuit is ☐ V.

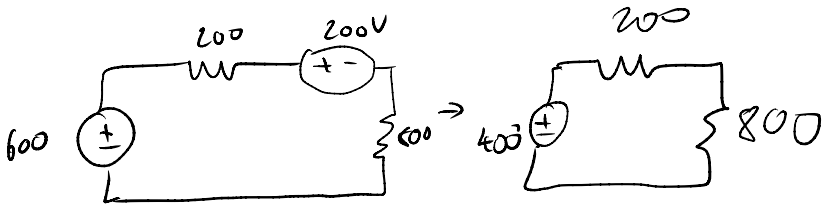


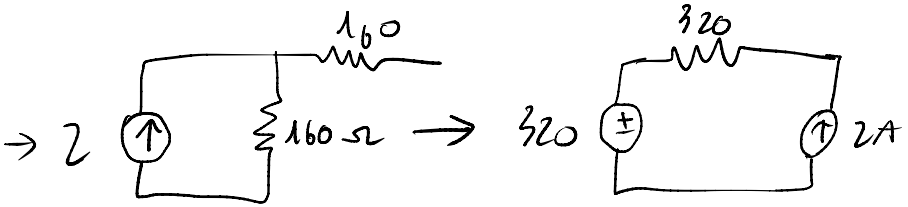


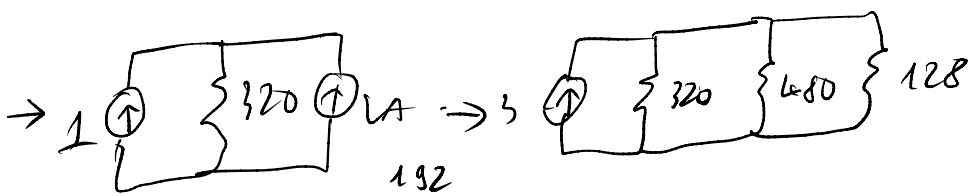
$$I = \frac{60 - 230}{8 + 12 + 20} = -4.75 \text{ A}$$

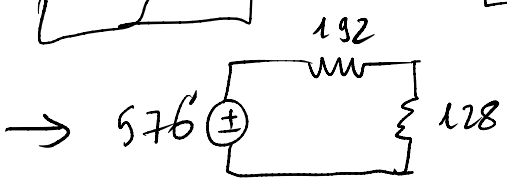
$$v_x = 12 I = -57 \text{ V}$$



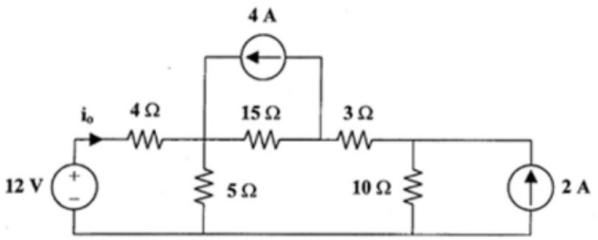


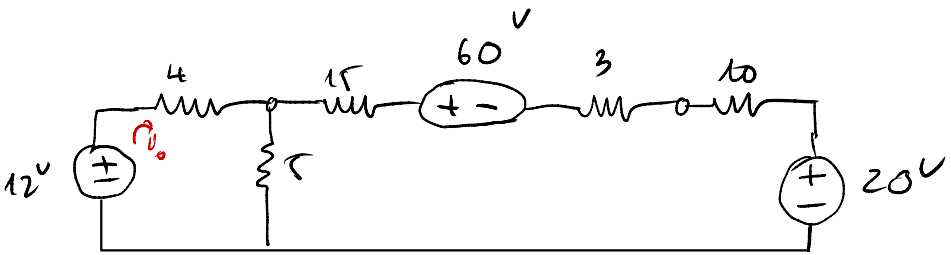


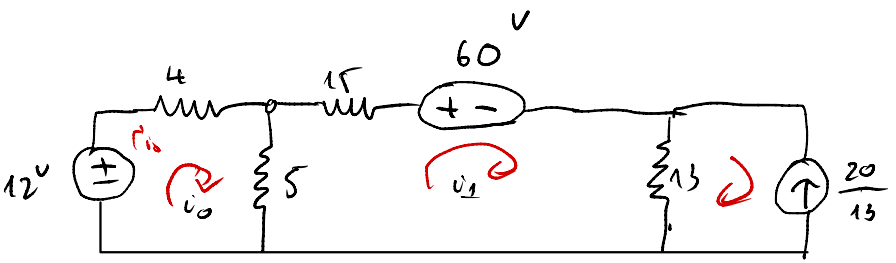




$$i_o = \frac{576}{192 + 128} = 1.8\ A$$





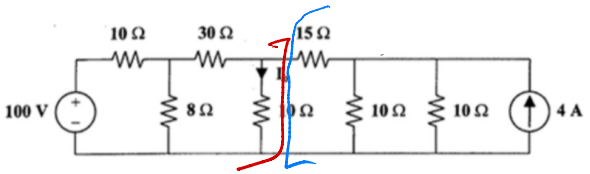


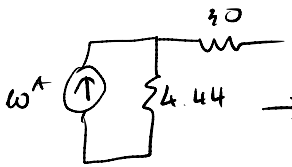
$$\begin{cases} 4i_0 + 5(i_0 + i_1) = 12 \\ 15i_1 + 5(i_1 - i_0) + 13(i_1 + \frac{20}{13}) = -60 \end{cases}$$

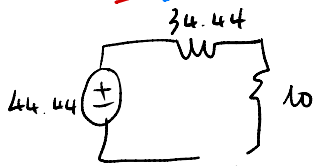
$\left(\pm\right) = (-\ +) \Rightarrow (\uparrow) = (\rightarrow)$

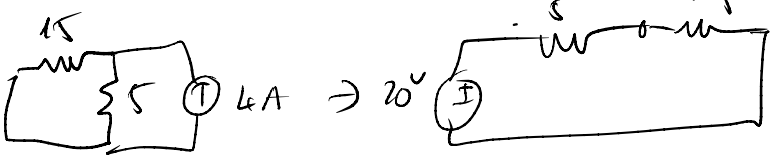
$\left(\mp\right) = (+\ -) \Rightarrow (\downarrow) = (\leftarrow)$

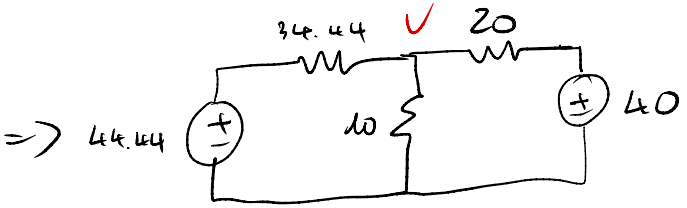
P2-Use source transformation to find I_0 in the circuit below.











$V = 12.8 \rightarrow I = 1.28\ A$