Voltage and Current

Topics:

A. Superposition Theorems

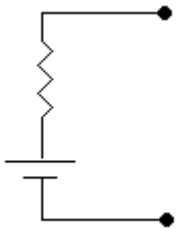
Purposes:

- Analyze networks that have two or more sources
- Determine the impact of a particular source on the response of the entire system

"The current through, or voltage across, any element of a network is equal to the algebraic sum of the currents or voltages produced independently by each source."

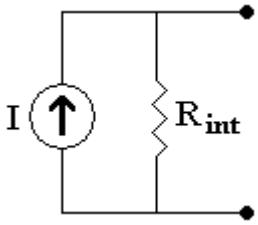
How?

- Voltage source ~>



~>

- Current source ~>



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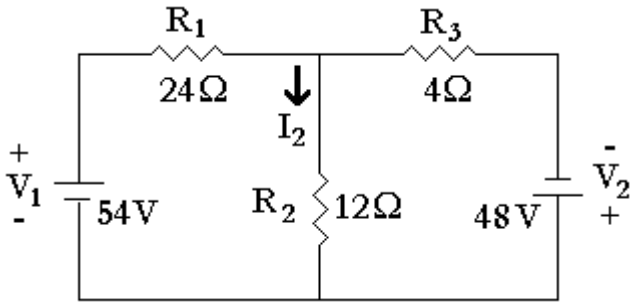
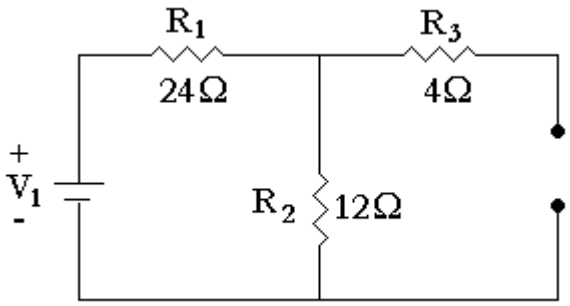
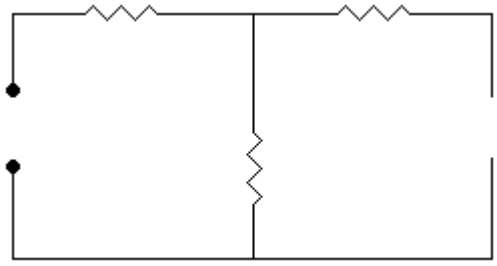
❋ Examples:



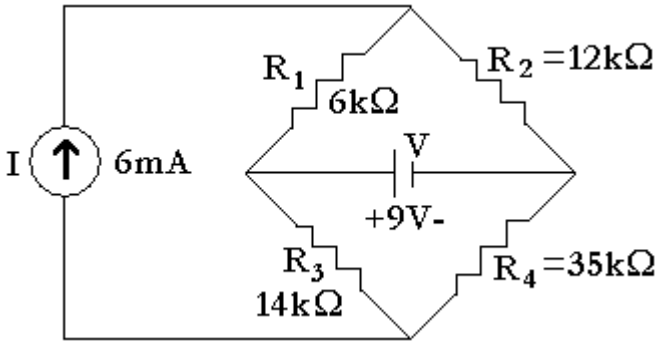
Find: I_2



What do we need to do next?

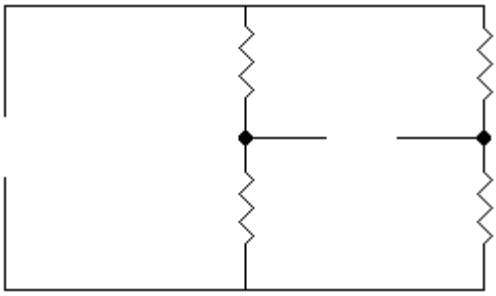


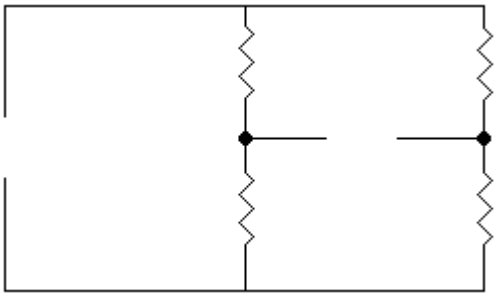
What do we need to do next?



Find I_2

What is our strategy to solve this problem?

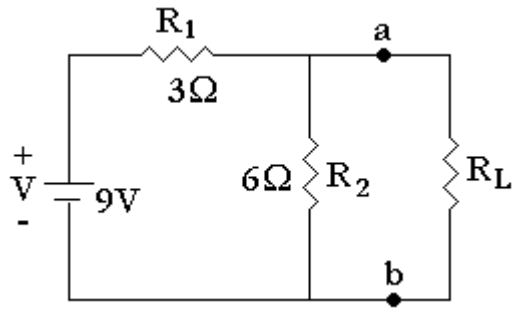




B. Thevenin's Theorem

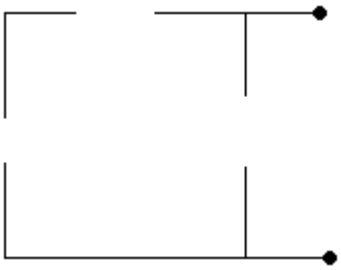
Purposes:

Examples:



Find the Thevenin equivalent circuit for the network.

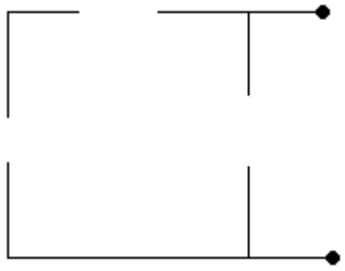
Step 1: Remove the load and mark the terminals of the two-terminal network



Step 2: Calculate R_{Th}

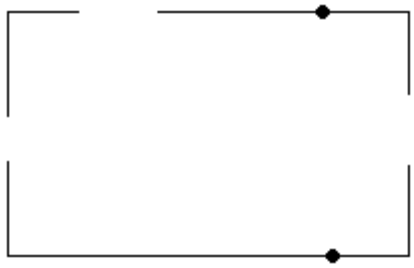
R_{Th} =

Step 3: Calculate V_{Th}



V_{Th} =

Step 4: Draw the Thevenin equivalent circuit



If R_L = 1Ω ~> I_L =

P =

If R_L = 2Ω ~> I_L =

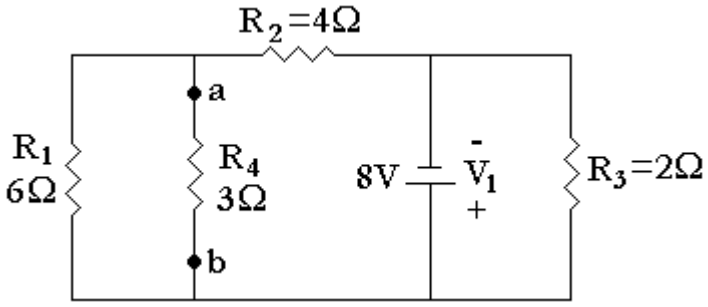
P =

If R_L = 10Ω ~> I_L =

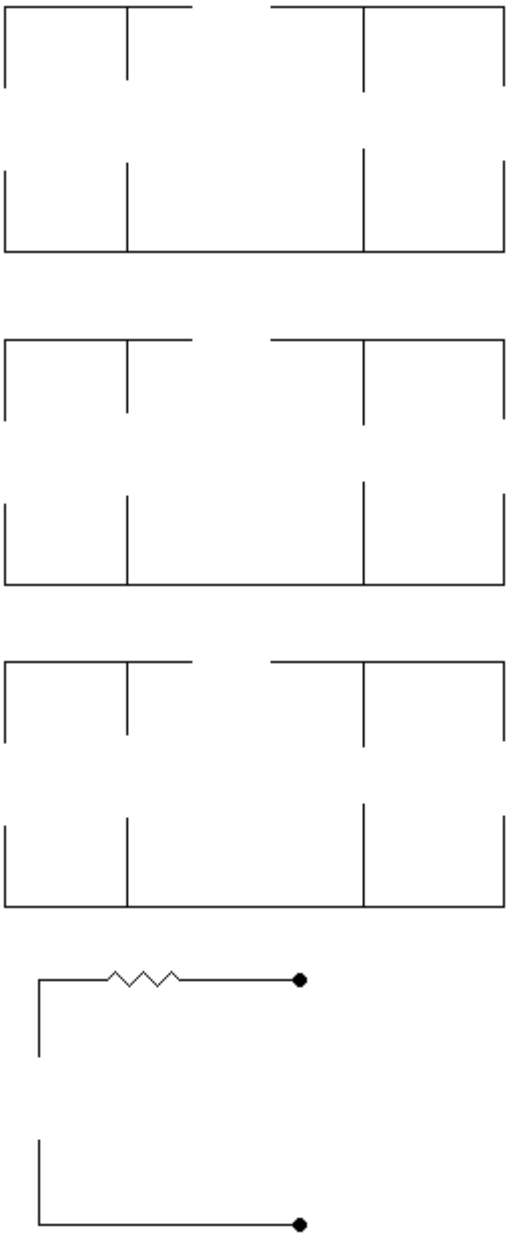
P =

If R_L = 100Ω ~> I_L =

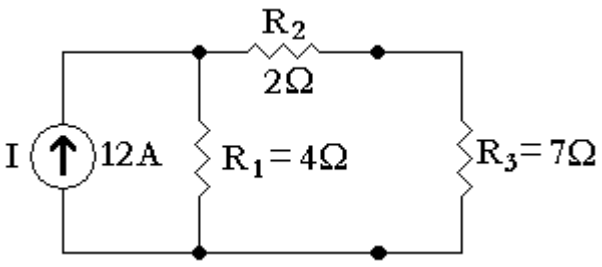
P =

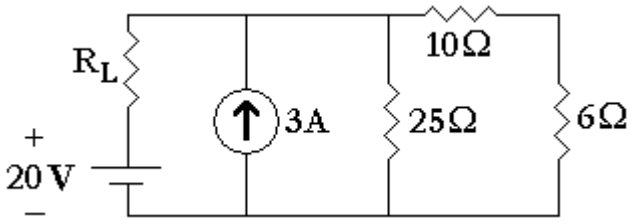


How do we solve this problem?

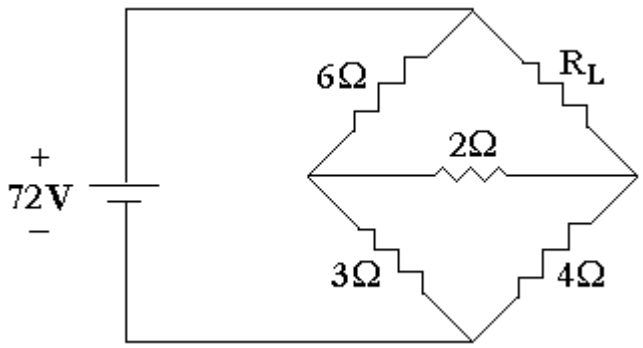


Find the Thevenin equivalent circuit.

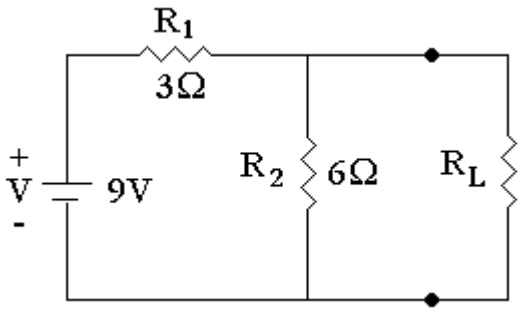




Find the Thevenin equivalent circuit.

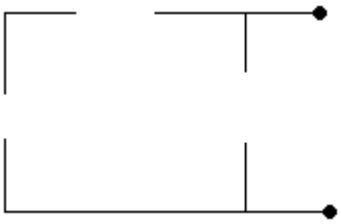

6Ω
R_L
2Ω
+
72V
−
3Ω
4Ω

C. Norton's Theorem



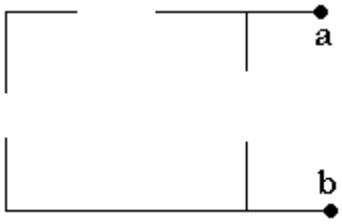
Find the Norton equivalent circuit for the network.

Step 1: Remove the R_L and mark the terminals of the two-terminal network.

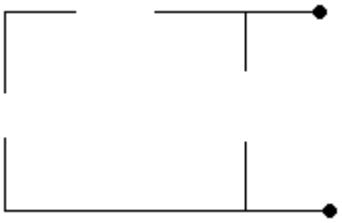


Step 2: Calculate R_N

RN =

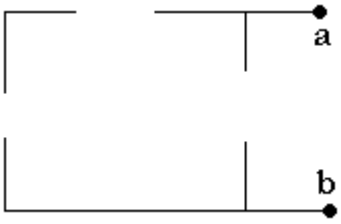


Step 3: Calculate I_N

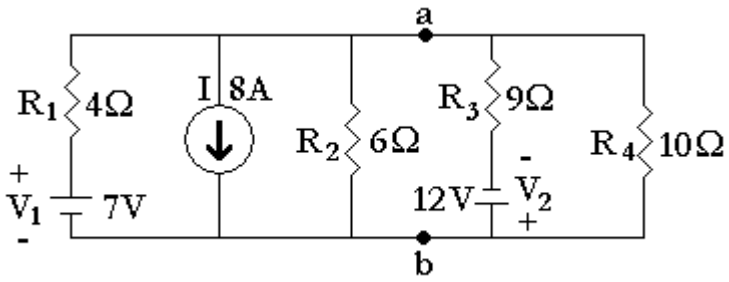


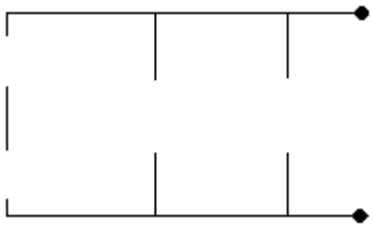
I_N =

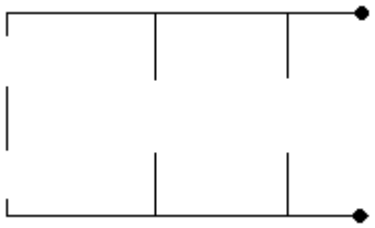
Step 4: Draw the Norton equivalent circuit

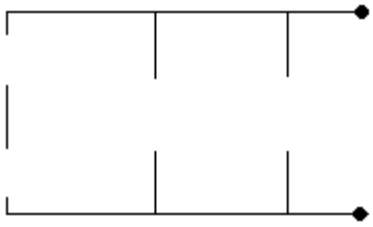


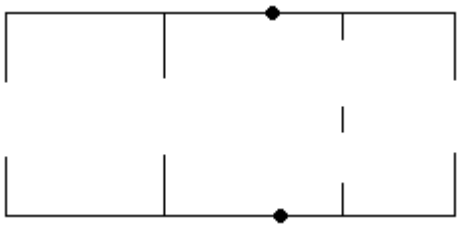
❋ Examples:



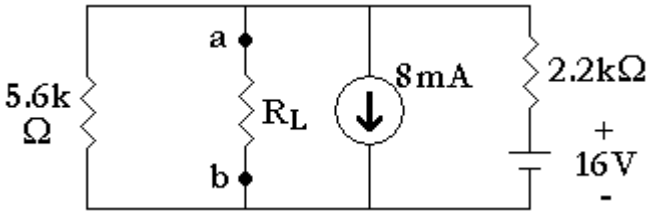






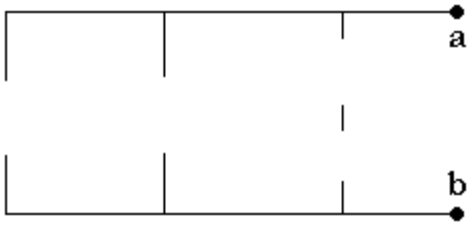


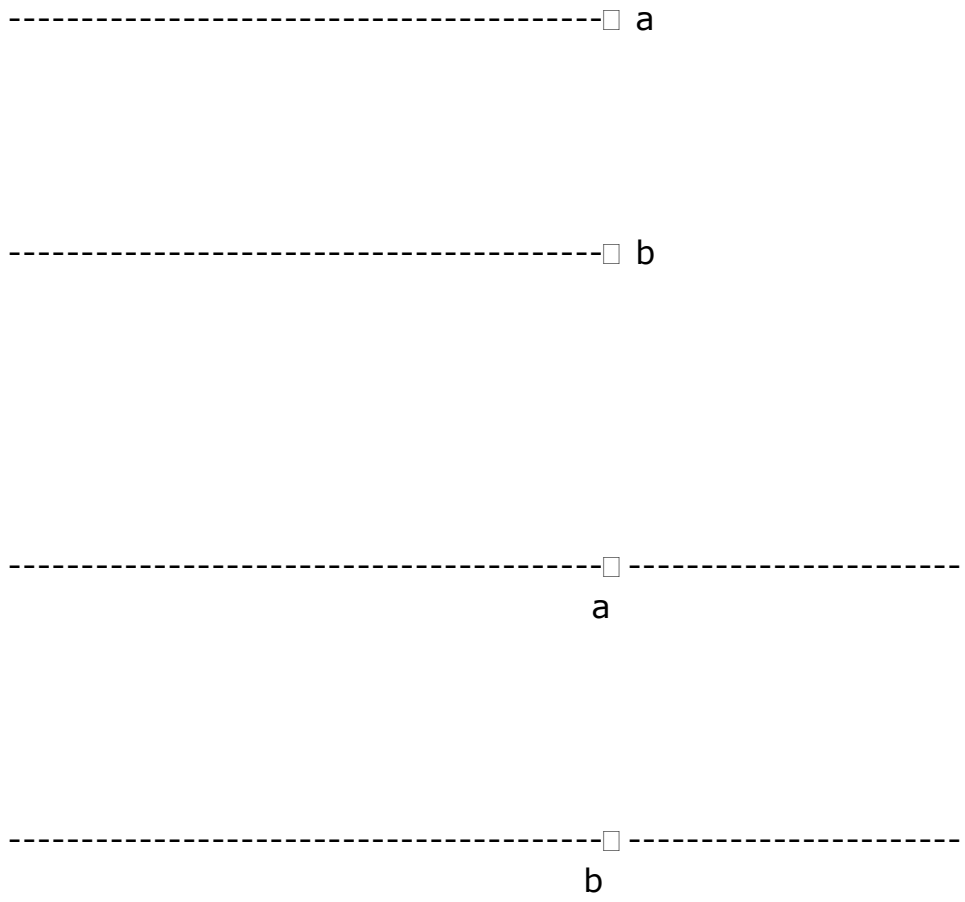
Find the Norton eq. circuit



----------□ a

----------□ b

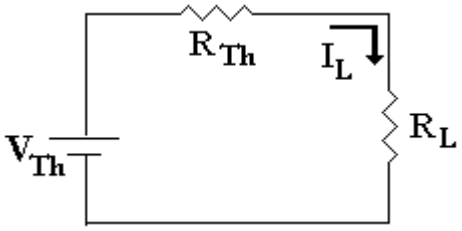



a
b
a
b

D. Maximum Power Transfer Theorem

A load will receive maximum power from a network when

$\therefore \quad R_L = R$



$I_L =$

$P_L =$

$\therefore \quad P_{L\ max} =$