Basic Elec. Engr. Lab

ECS 204

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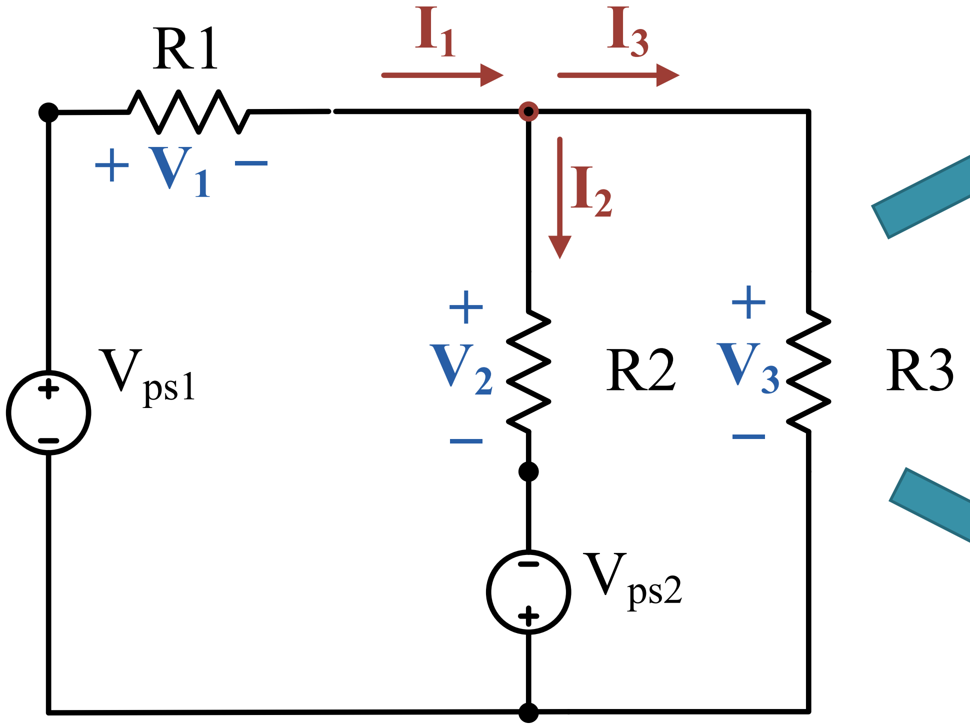
Lab 3

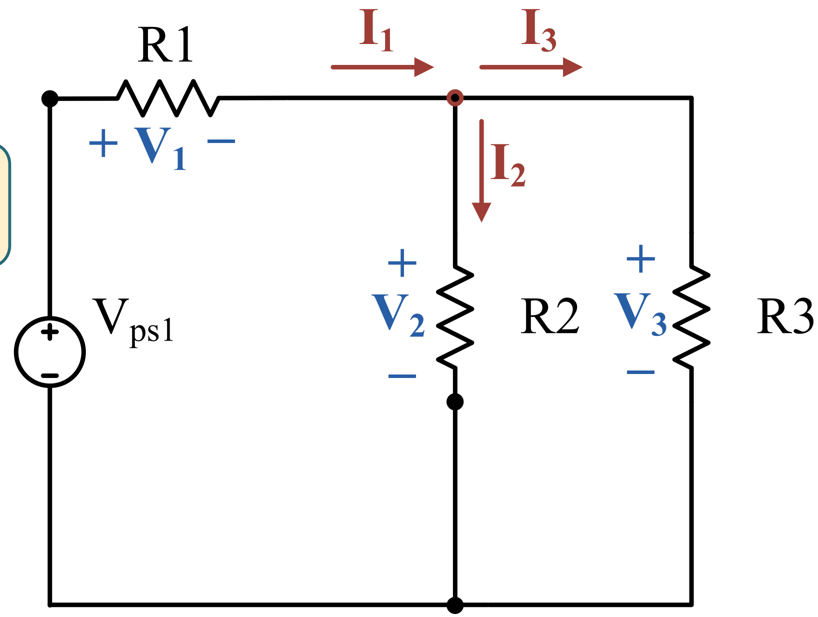
- Superposition Theorem (Part A)
- Maximum Power Transfer (Part B)

Part A

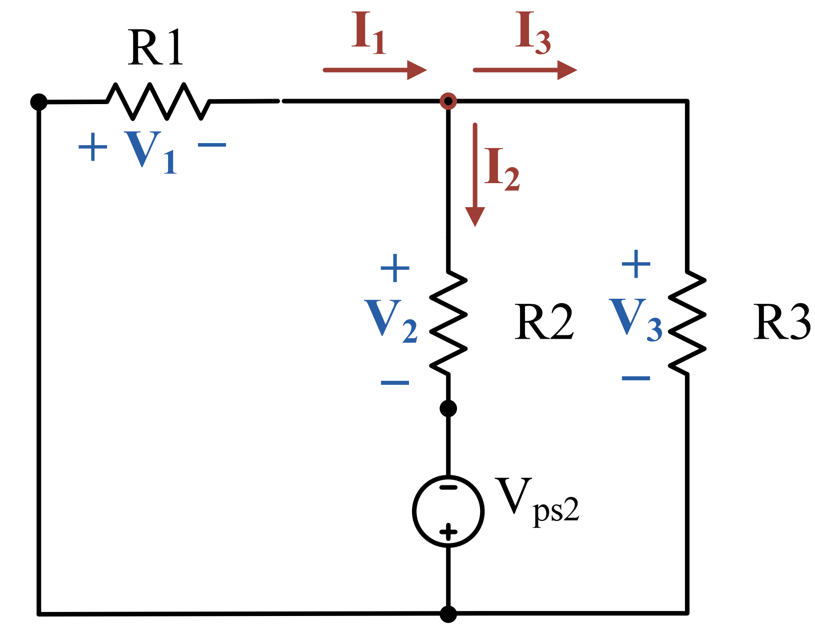
A.(a)



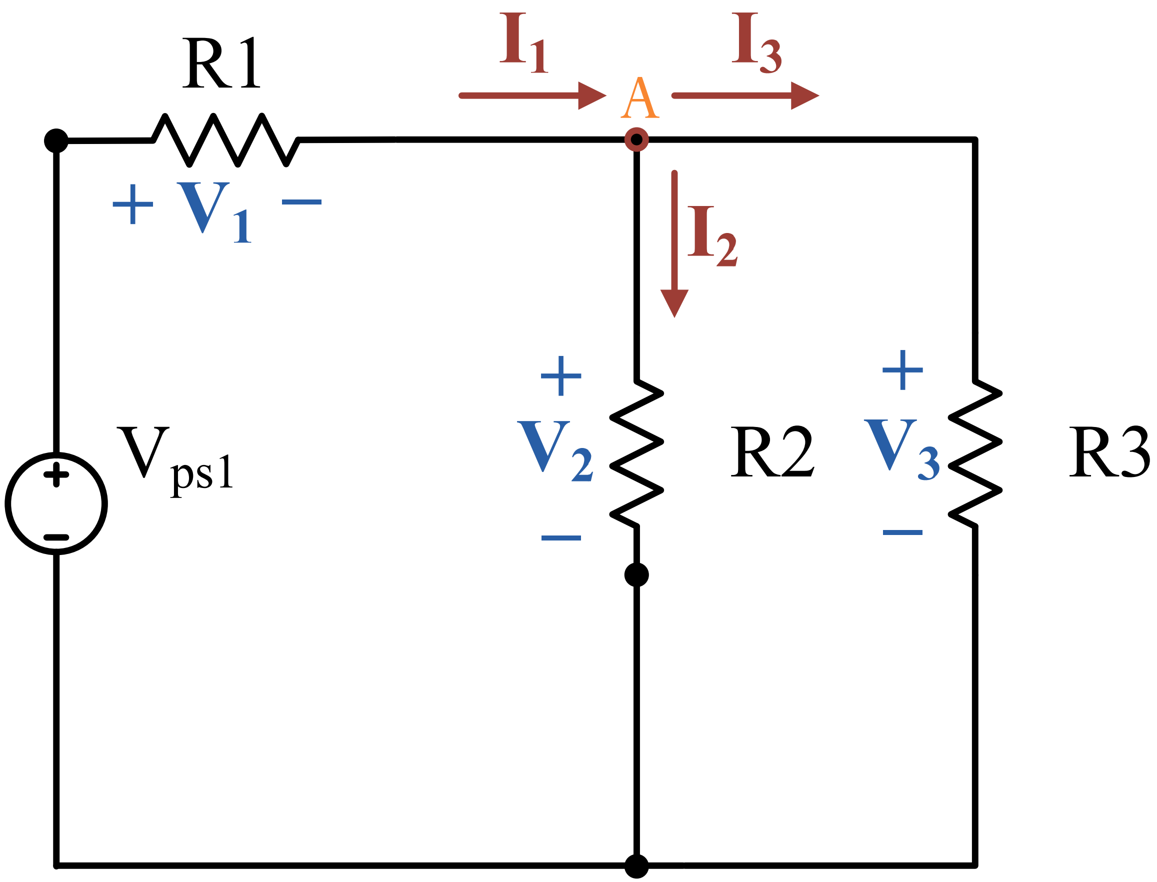
A.(b)



A.(c)



A.(b)



Voltage divider

$$V_A^{(b)} = \frac{R_2 // R_3}{R_1 + (R_2 // R_3)} V_{ps1}$$

$$V_1^{(b)} = V_{ps1} - V_A$$

$$V_2^{(b)} = V_A$$

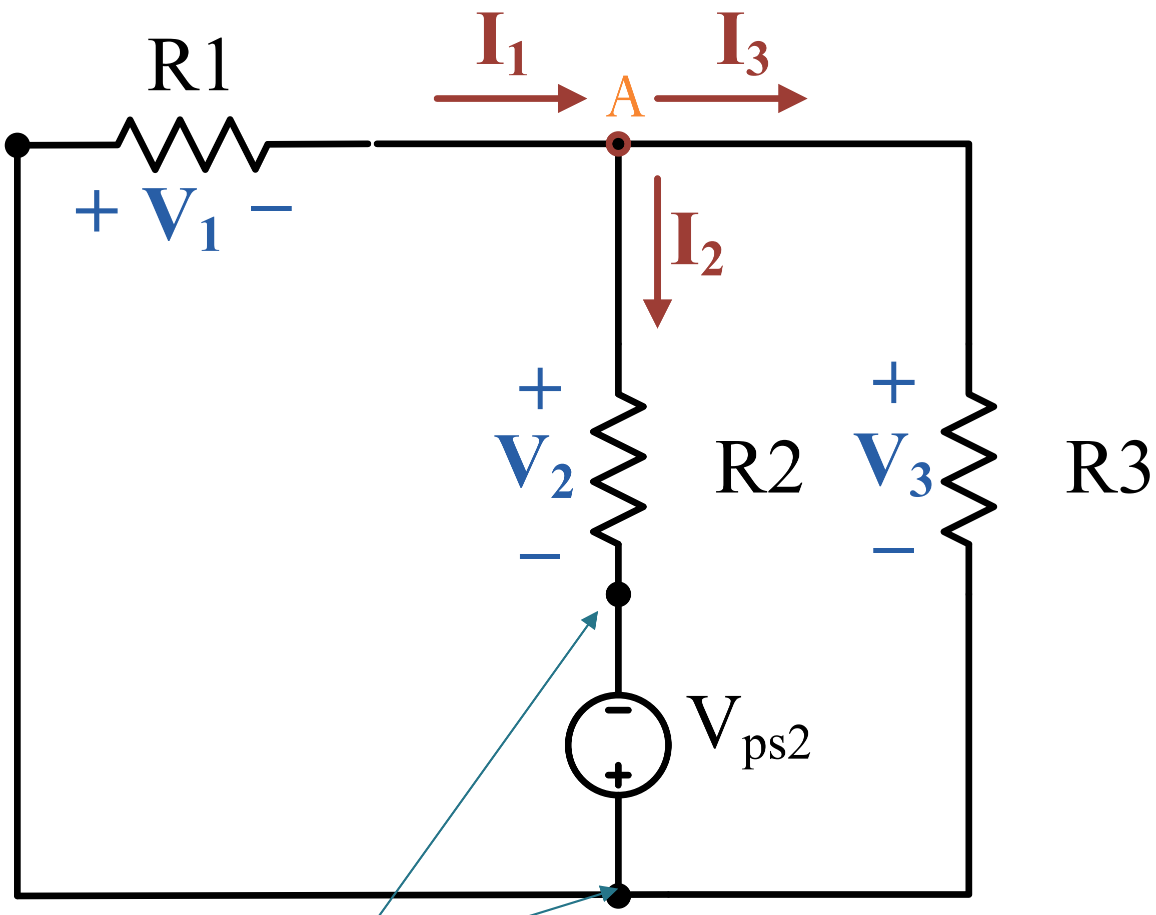
$$V_3^{(b)} = V_A$$

$$I_1^{(b)} = \frac{V_1}{R_1}$$

$$I_2^{(b)} = \frac{V_2}{R_2}$$

$$I_3^{(b)} = \frac{V_3}{R_3}$$

A.(c)



Voltage divider

$$V_A^{(c)} = \frac{R_1 // R_3}{R_2 + (R_1 // R_3)} \times (-V_{ps2})$$

$$V_1^{(c)} = -V_A$$

$$V_2^{(c)} = V_A - (-V_{ps2})$$

$$V_3^{(c)} = V_A$$

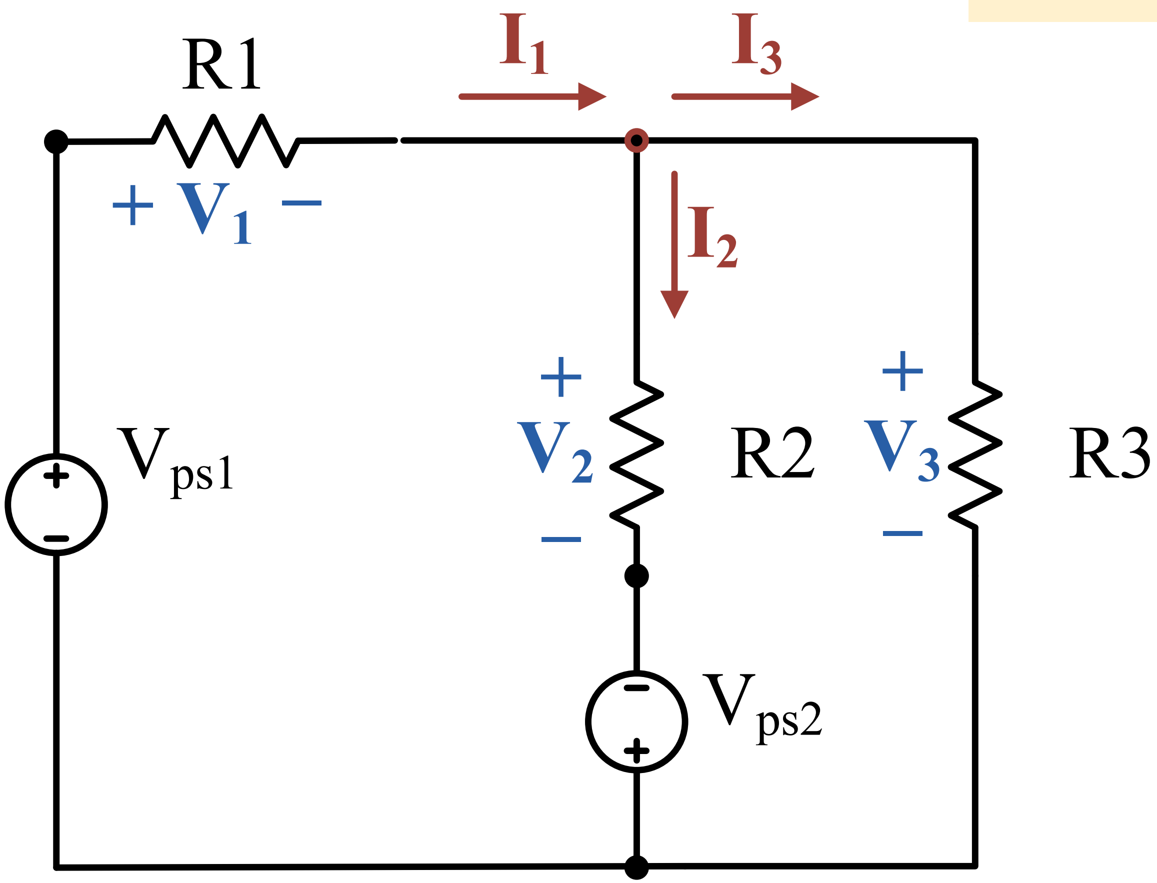
$$I_1^{(c)} = \frac{V_1}{R_1}$$

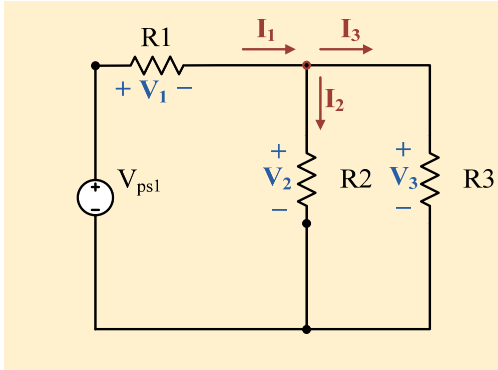
$$I_2^{(c)} = \frac{V_2}{R_2}$$

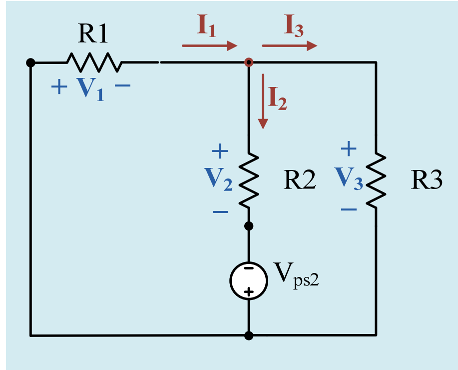
$$I_3^{(b)} = \frac{V_3}{R_3}$$

These two nodes are not the same. Resistor R2 and R3 are not in parallel.

A.a







$$V_1^{(a)} = V_1^{(b)} + V_1^{(c)}$$

$$V_2^{(a)} = V_2^{(b)} + V_2^{(c)}$$

$$V_3^{(a)} = V_3^{(b)} + V_3^{(c)}$$

$$I_1^{(a)} = I_1^{(b)} + I_1^{(c)}$$

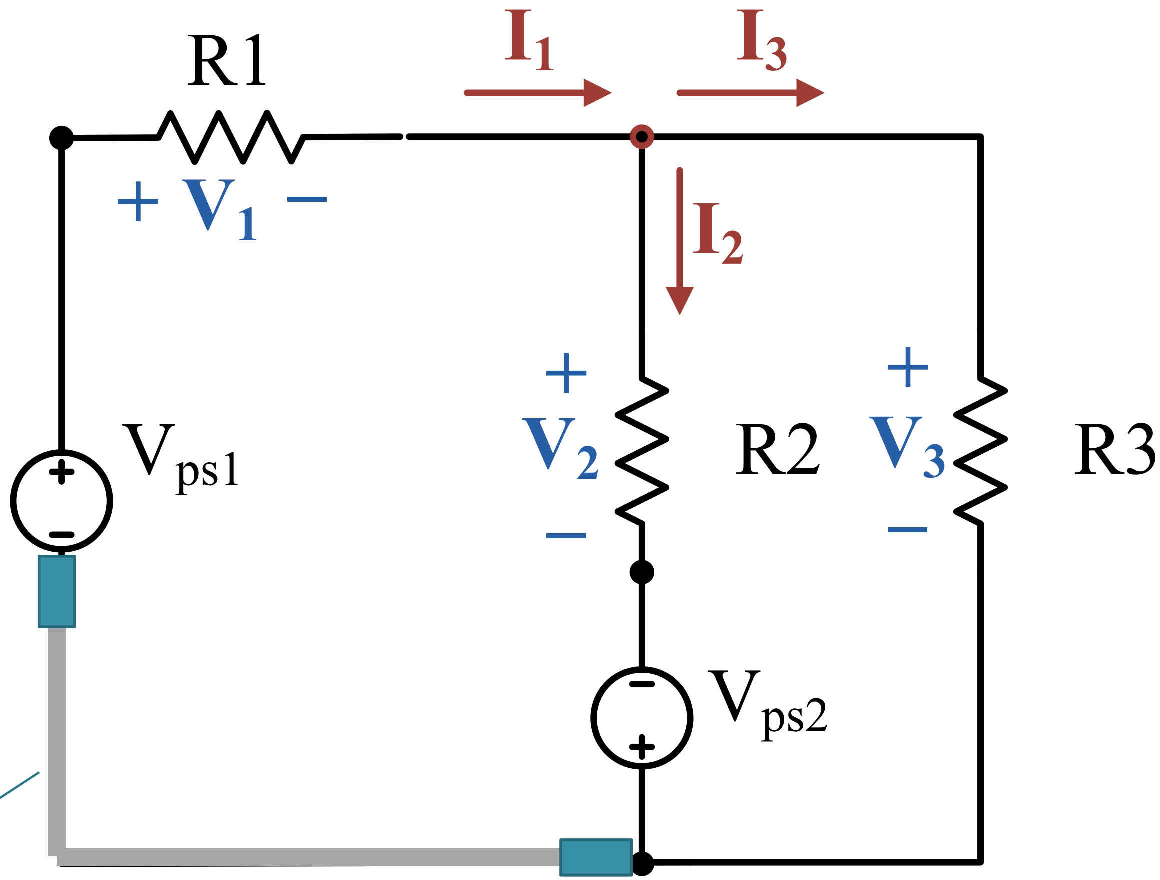
$$I_2^{(a)} = I_2^{(b)} + I_2^{(c)}$$

$$I_3^{(a)} = I_3^{(b)} + I_3^{(c)}$$

Remark: Some of these values will be negative!!

Multiple voltage sources

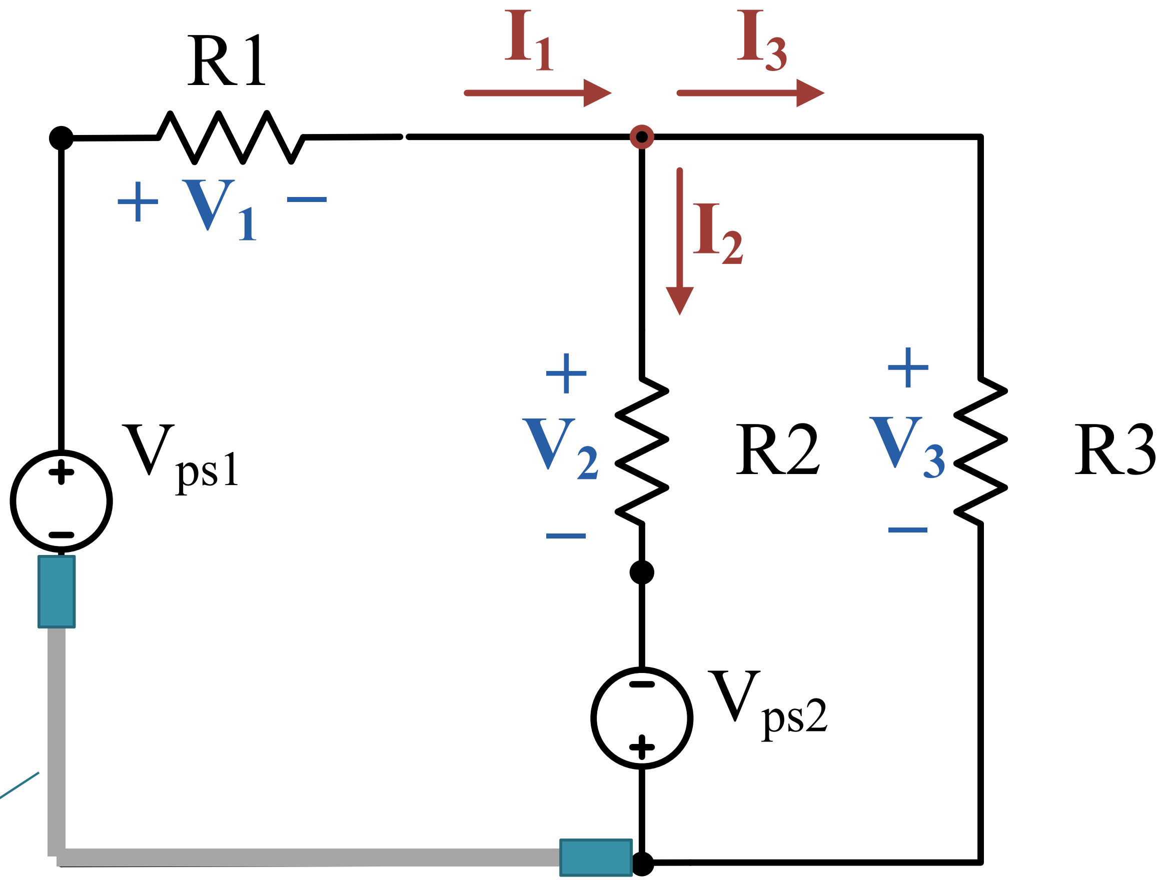
Vps2 Vps1



This connection can use the small connector.

Note that it is the "-" (black) terminal of Vps1 that is connected to the "+" (red) terminal of Vps2.

Multiple voltage sources

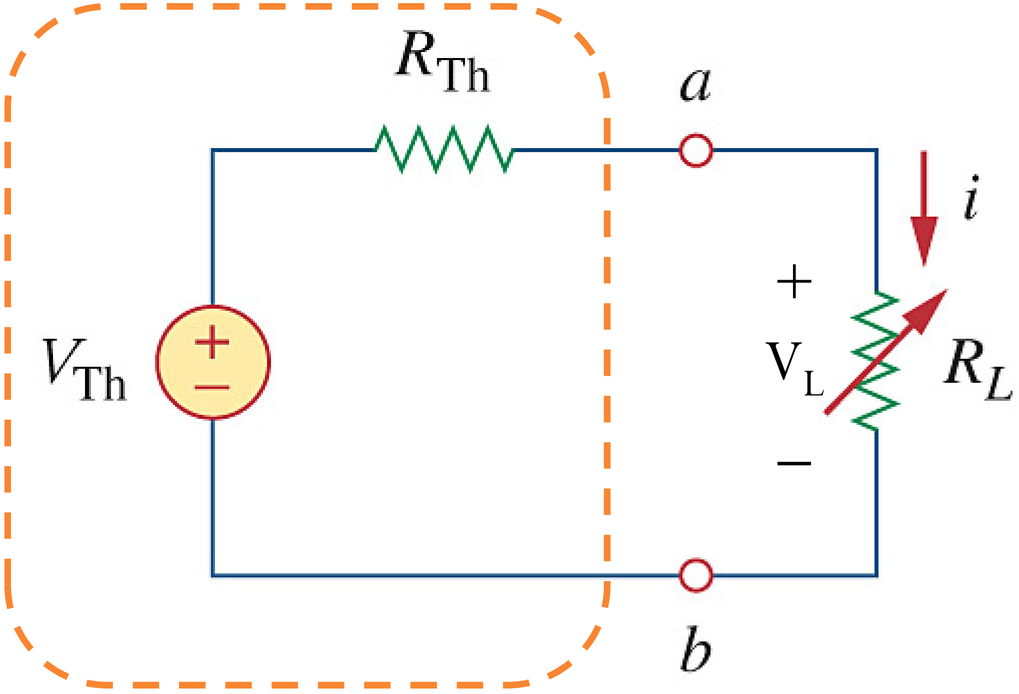


This connection can use the small connector.

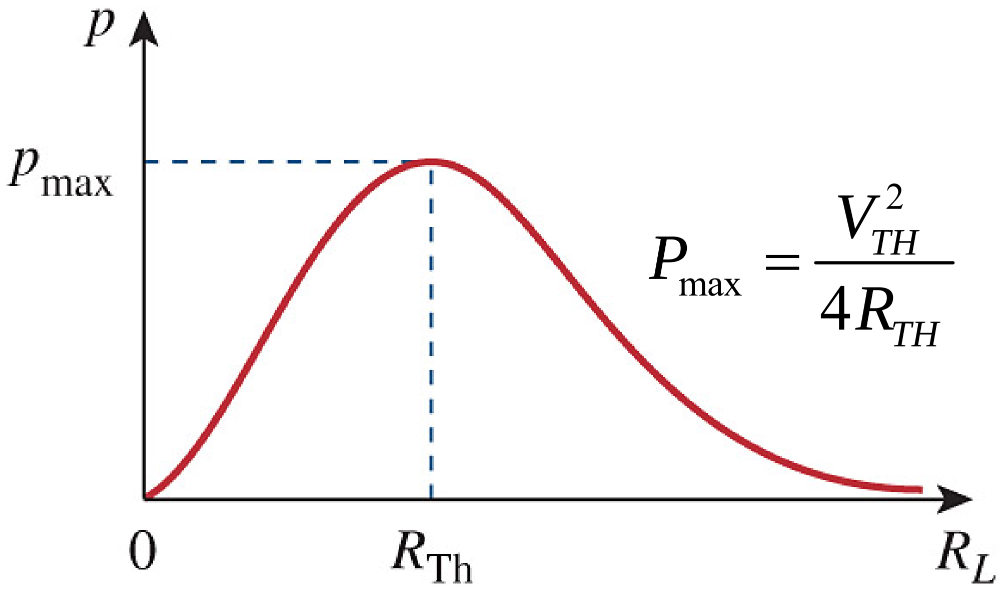
Note that it is the "-" (black) terminal of Vps1 that is connected to the "+" (red) terminal of Vps2.

Part B

$$P_L = \frac{V_L^2}{R_L}$$



R_C = ____________ Ω		V_{PS1} = ________ V	
R_L (Ω)		V_L (V)	Calculated P_L (mW)
0			
300			
600			
900			
950			
1000			
1050			
1100			
1400			
1700			
2000			



$$P_{max} = \frac{V_{TH}^2}{4R_{TH}}$$

You may have to combine the potentiometer (in series) with some regular resistor to produce the desired resistance value.