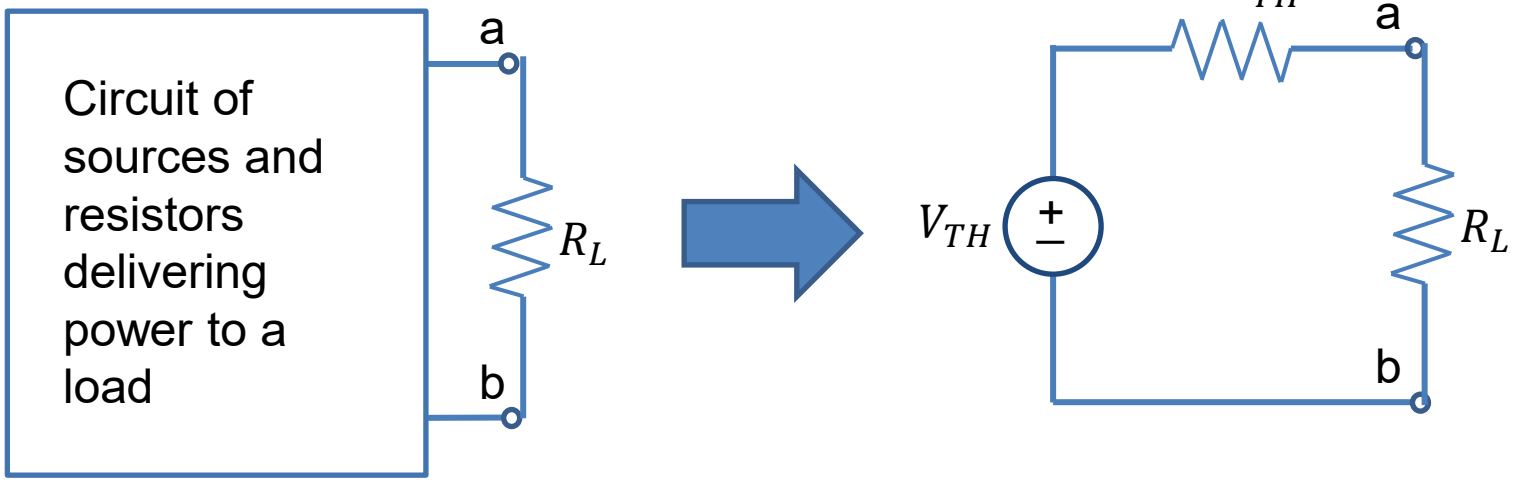
# Power Transfer

We are often concerned with delivering the most amount of power that we can to a load. We can easily see how to achieve this by using the Thevenin equivalent.

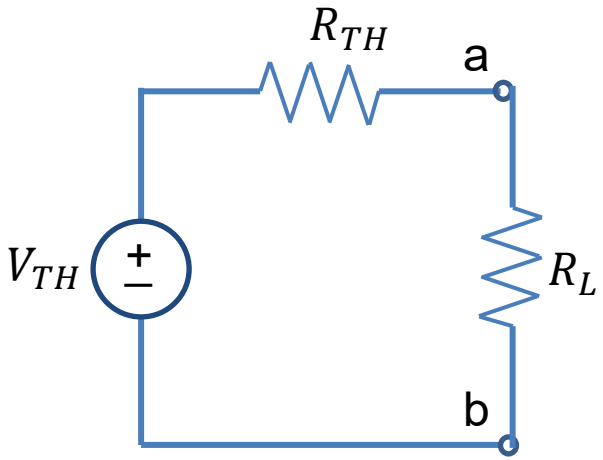



Now it is a relatively simple exercise in calculus to find the value of $R_L$ that maximizes $P_L$.

$$V_L = V_{TH}\frac{R_L}{R_L + R_{TH}}$$

$$P_L = \frac{(V_L)^2}{R_L} = \frac{(V_{TH})^2 R_L}{(R_L + R_{TH})^2}$$

# Power Transfer




$$P_L = \frac{(V_L)^2}{R_L} = \frac{(V_{TH})^2 R_L}{(R_L + R_{TH})^2}$$

$$\frac{dP_L}{dR_L} = (V_{TH})^2 \frac{(R_L + R_{TH})^2 - 2R_L(R_L + R_{TH})}{(R_L + R_{TH})^4} = 0$$

To maximize power delivered to a load, we should choose the load resistance equal to the Thevenin equivalent resistance of the circuit.

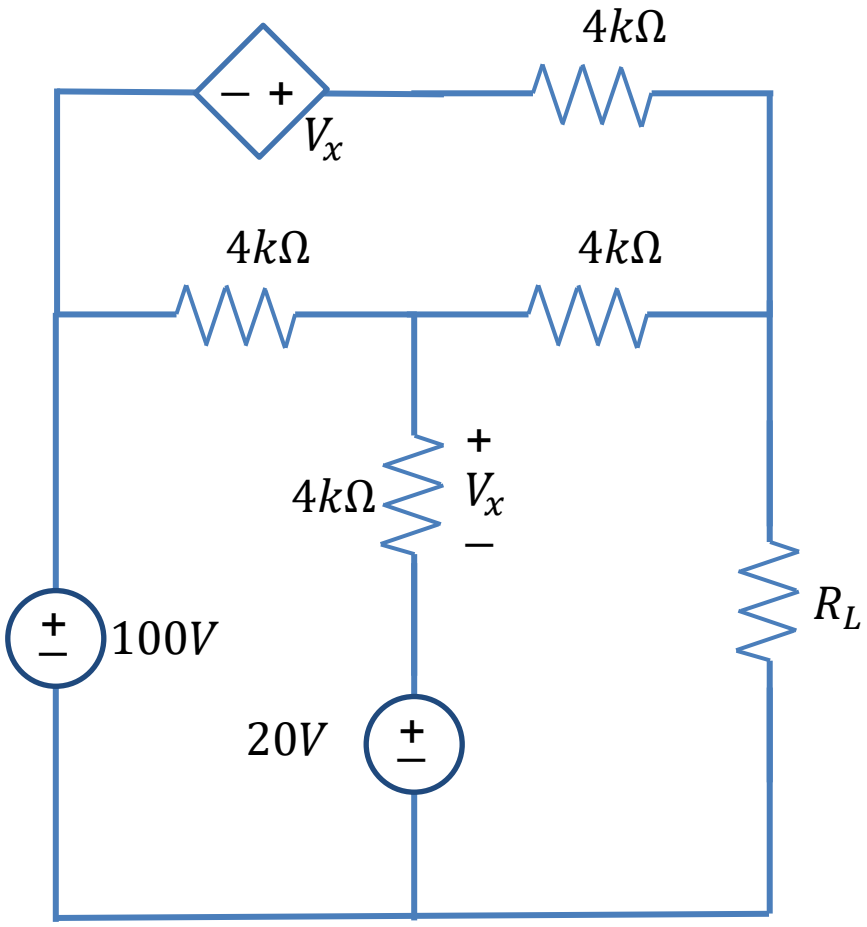
$$(R_{TH} + R_L)(R_{TH} - R_L) = 0$$

$$R_L = R_{TH}$$

$$P_L = \frac{(V_{TH})^2}{4R_{TH}}$$

# Example

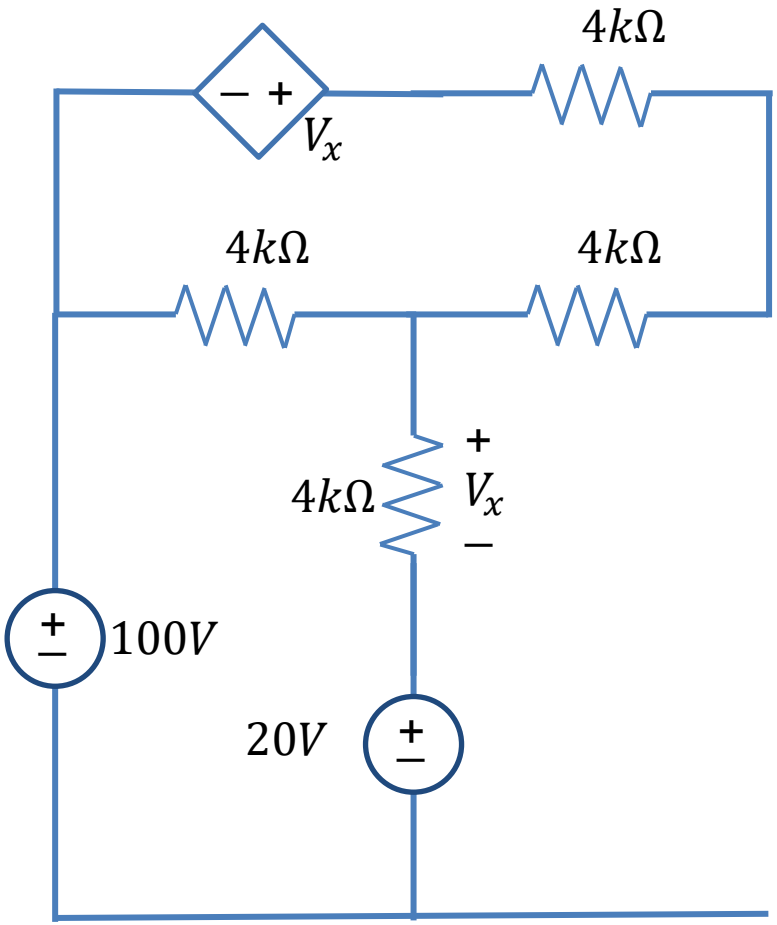
(a) Find $R_L$ that maximizes power transfer to the load.
(b) What is the maximum power transferred to the load?



# Example

(a) Find $R_L$ that maximizes power transfer to the load.
(b) What is the maximum power transferred to the load?

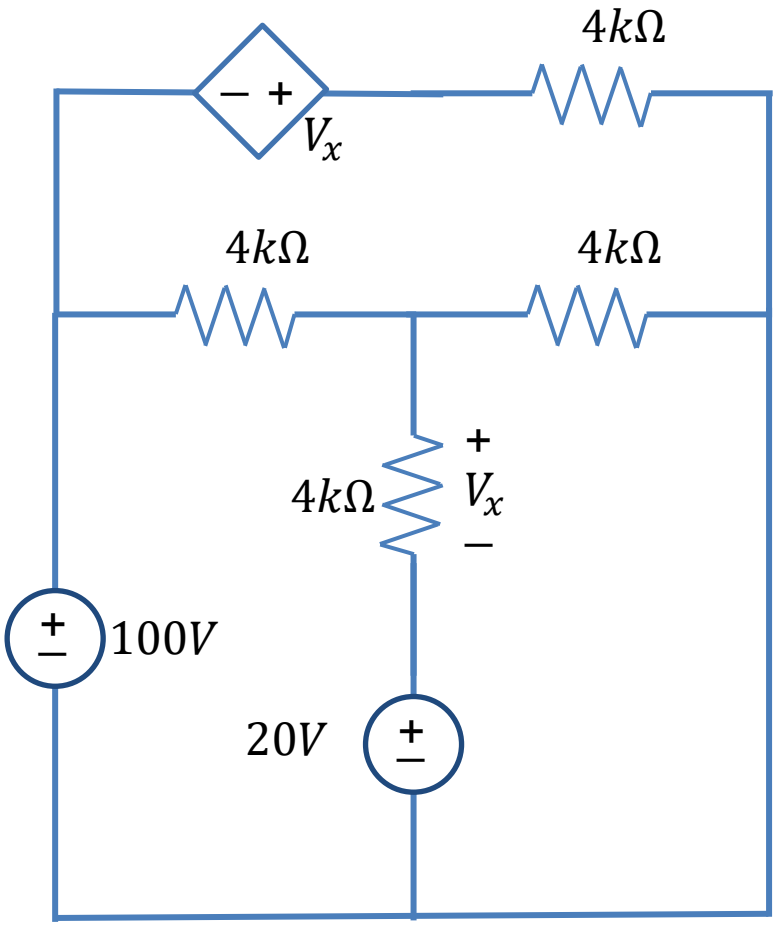
Open Circuit Voltage



# Example

(a) Find $R_L$ that maximizes power transfer to the load.
(b) What is the maximum power transferred to the load?

Short Circuit Current



# Example

(a) Find $R_L$ that maximizes power transfer to the load.
(b) What is the maximum power transferred to the load?

Alternatively (Method 3)
Disable Independent Sources
and Apply Test Source