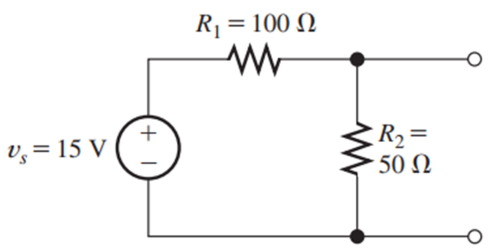
Determining the Thevenin Equivalent Circuit

Tuesday, 28 July, 2020 11:02 AM



(a) Original circuit

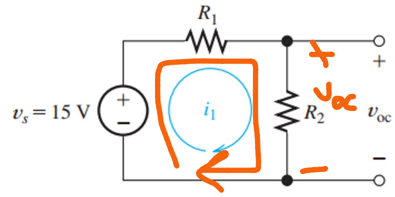
1. Open-Circuit Voltage (Voc) = Vt

KVL:

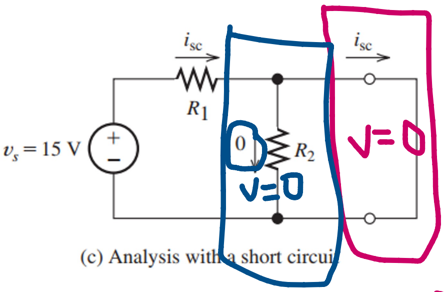
I1 R1 + I1 R -15 =0

I1 (100+50) = 15

I1= 15/150 = 0.1 A



Voc = i1 * R2 = 0.1*50 = 5 V



(c) Analysis with a short circuit

2. Short-circuit Current:

KCL:

Isc= Vs/R1 = 15/100 = 0.15 A

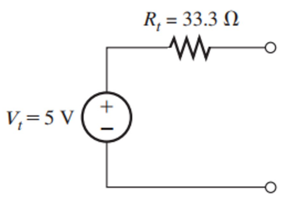
$0 = ? \times 50$

$V = I_{sc} \times 0$

According to the Theorem,

Vt = Voc = 5V

Rt = Vt/Isc = 5/0.15 = 33.3333 Ohm



Finding Thevenin's Equivalent Resistance Directly

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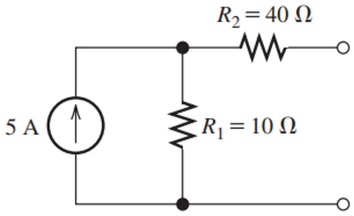
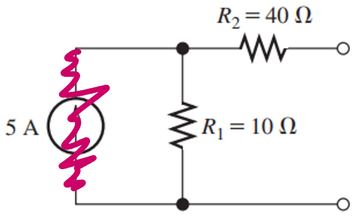
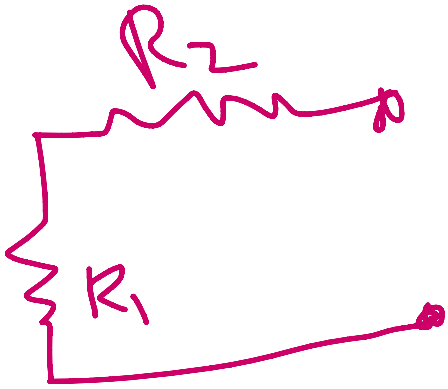




We replace voltage sources with short circuits and replace current sources with open circuits



R_{th} = R1+ R2 = 50 Ohm

Finding Thevenin's Equivalent Resistance Directly & Finding the Thevenin's Equivalent

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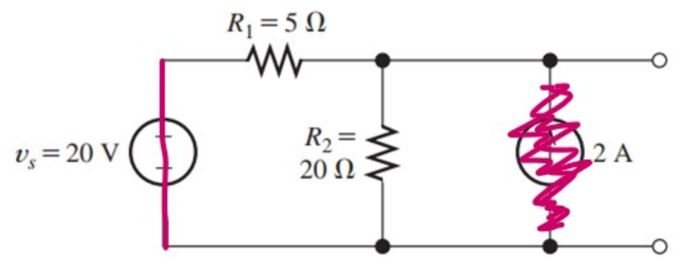
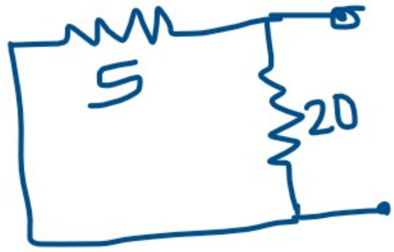
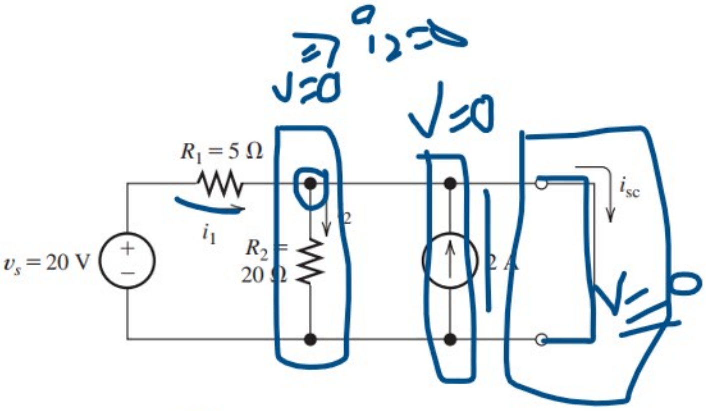
We replace voltage sources with short circuits and replace current sources with open circuits





1. Rt
2. Vt

Rt = 4 Ohm



Rt= Vt/**isc**

Vt = 24 V

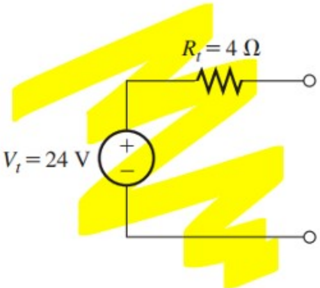
KCL :

I1 + 2 = i2+ isc

Vs/r1 + 2 = 0 + isc

20/5 + 2 = isc

Isc = 6 A



Finding the Thevenin Resistance

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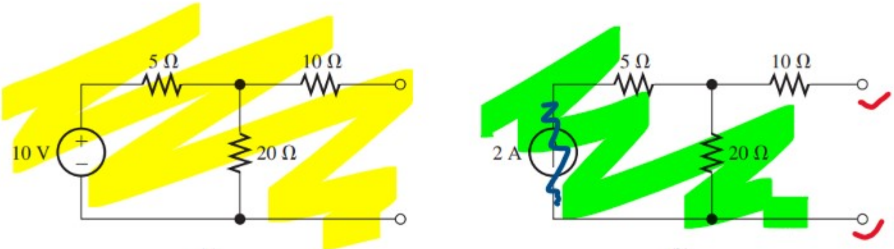
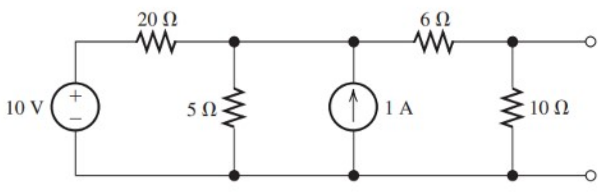
Voltage Sources - Short-Circuit Circuit

Current Sources - Open Circuit

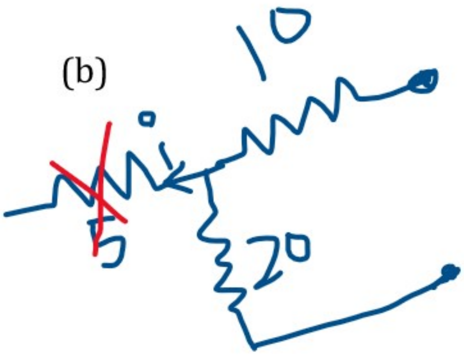


(a) (b)

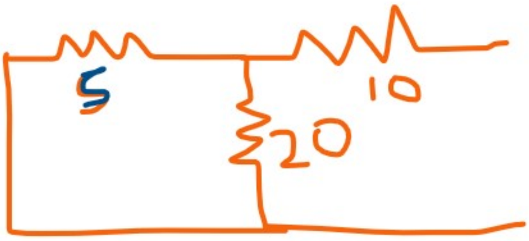


(c)

(b)



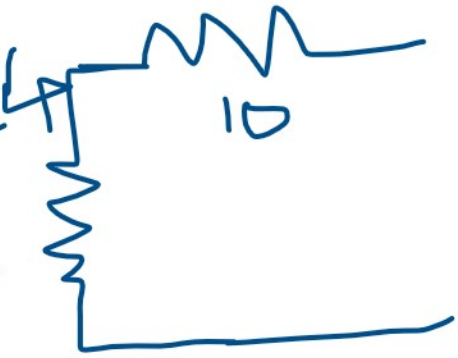
(a)

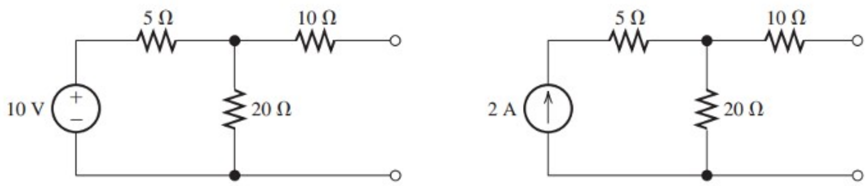


Rt = 14 Ohm

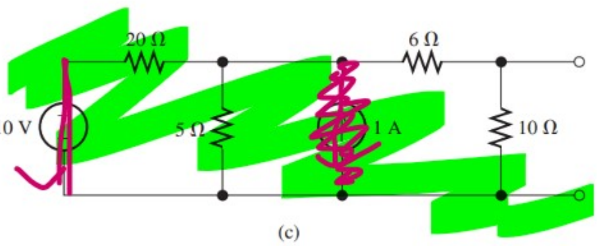
Rt = 30 Ohm

$$\frac{1}{\frac{1}{5}+\frac{1}{20}} =$$

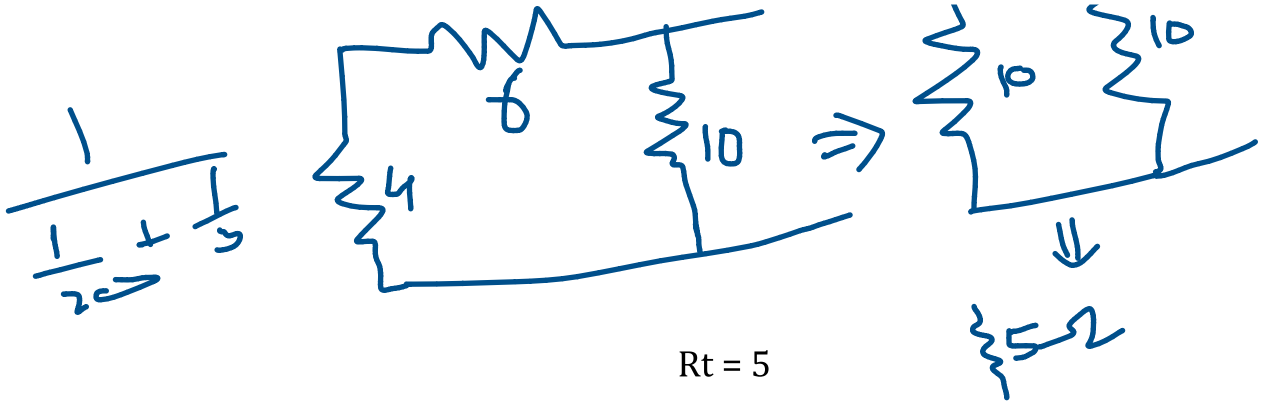




(a) (b)



(c)



Rt = 5

Determining Maximum Power Transfer

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