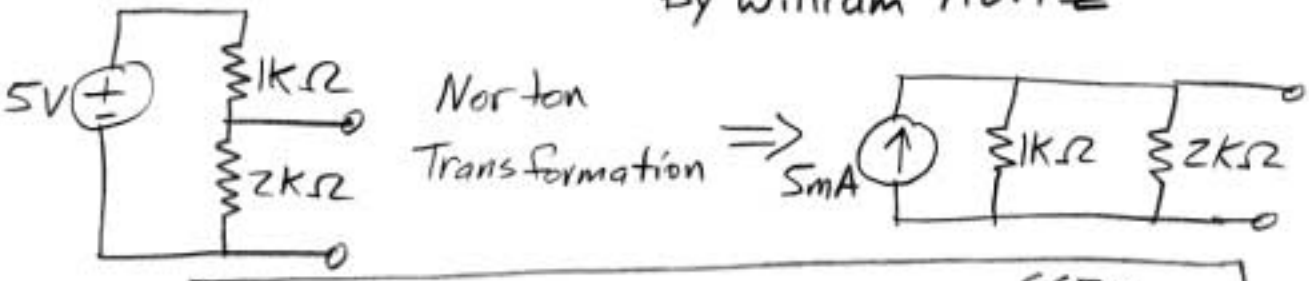
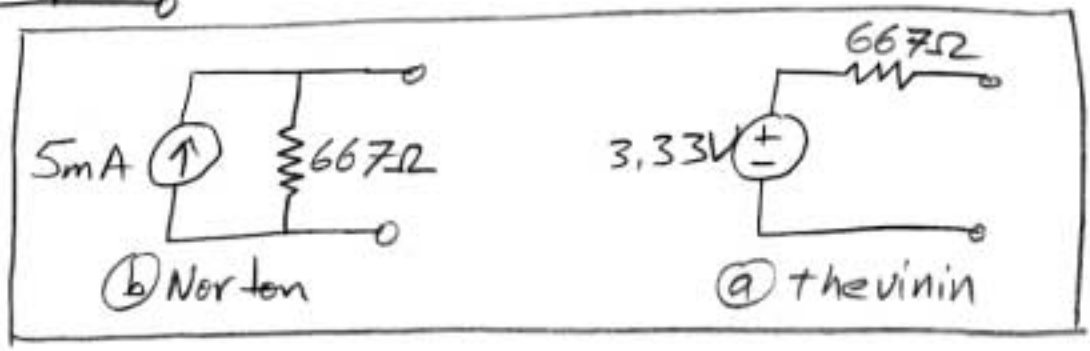
EE 105 Spring 2001 – Homework 1 solution

by William Holtz

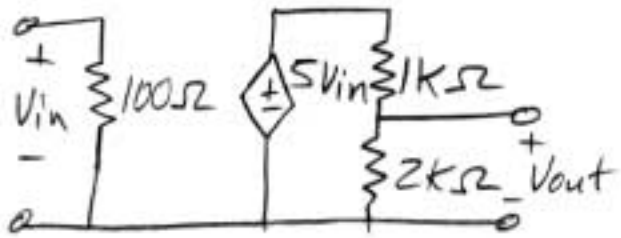
1.1)



combine parallel resistors



1.2)

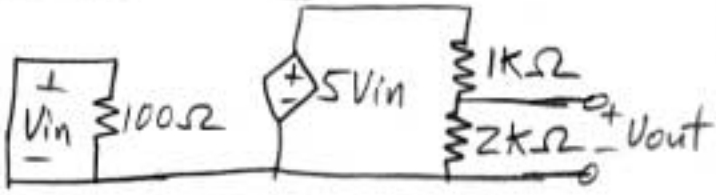


Voltage divider

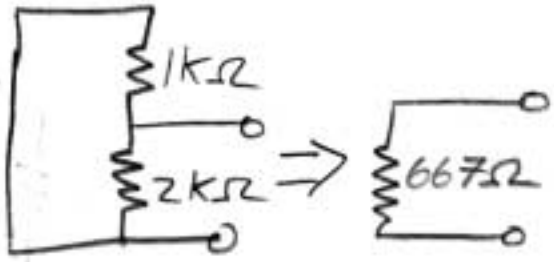
$$5Vin\left(\frac{2k}{1k+2k}\right) = Vout$$

(a) $3.33 = Vout/Vin$

short independent sources before finding Rout



$Vin = 0 \Rightarrow$



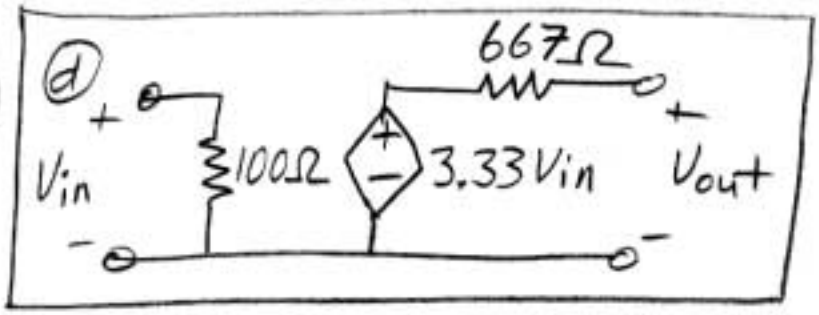
(b) $Rout = 667\Omega$

for Rin only right hand side of the circuit matters as the left hand side is only connected by one wire and the right hand side has no dependent sources to receive information from the left hand side

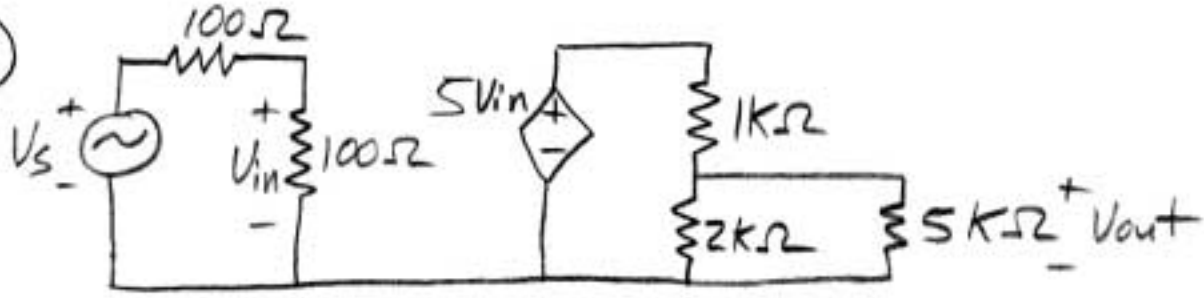
$\therefore$ only the 100Ω resistor is left

(c) $Rin = 100\Omega$

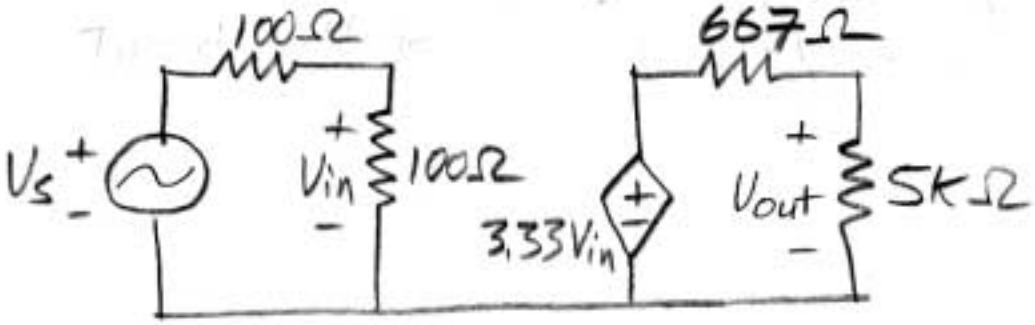
1.2 cont)



1.3)



substitute 2-port from 1.2d



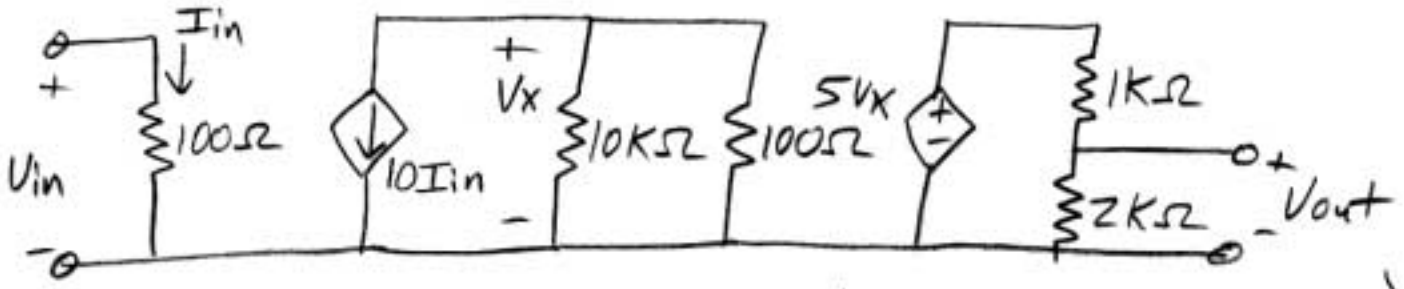
Input voltage divider $V_s\left(\frac{R_{in}}{R_s+R_{in}}\right)=V_{in}$

Output voltage divider $3.33V_{in}\left(\frac{R_L}{R_{out}+R_L}\right)=V_{out}$

$$V_s\left(\frac{R_{in}}{R_s+R_{in}}\right)3.33\left(\frac{R_L}{R_{out}+R_L}\right)=V_{out}$$

⑨ $$\frac{V_{out}}{V_s}=\left(\frac{R_{in}}{R_s+R_{in}}\right)\left(3.33\right)\left(\frac{R_L}{R_{out}+R_L}\right)=1.47$$

1.4) first and last segment are the same so Rin and Rout stay the same. Just need to find $\frac{V_{out}}{V_{in}}$



$$I_{in} = \frac{V_{in}}{100}\ ;\quad V_x = 10 I_{in}\left(\frac{10000 \cdot 100}{10000+100}\right);\quad V_{out} = 5V_x\left(\frac{2000}{1000+2000}\right)$$

$$5 \cdot 10 \cdot \frac{V_{in}}{100}(99)\left(\frac{2}{3}\right) = V_{out}$$

A negative sign is missing from this problem.
Vx=-10Iin(...) => -33=Vout/Vin

$$33 = \frac{V_{out}}{V_{in}}$$