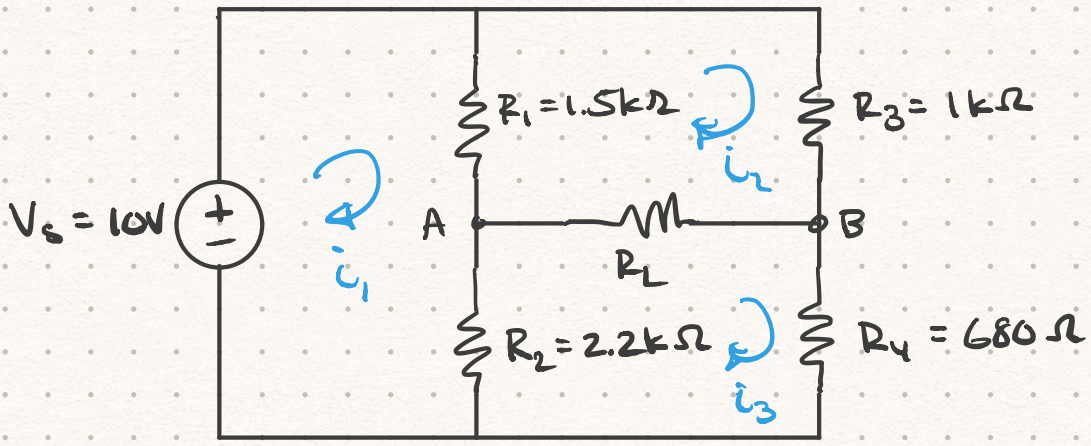
Circuit to Analyze:



R_L values to test:
a) 390Ω
b) 680Ω
c) $1.2k\Omega$
d) $2.2k\Omega$
e) $3.9k\Omega$
f) $\infty\Omega$, 10e7 in Python

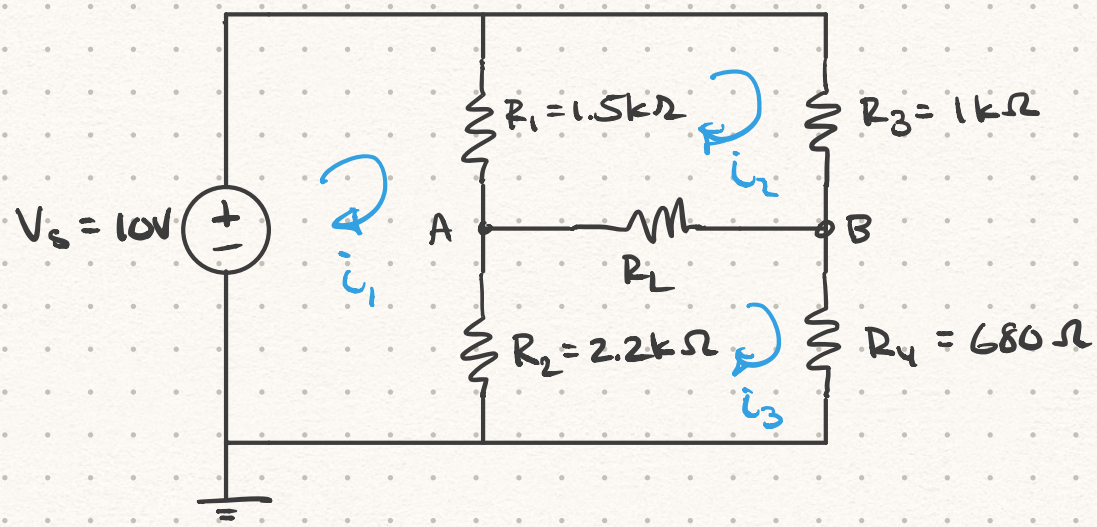
$$-10 + R_1(i_1 - i_2) + R_2(i_1 - i_3) = 0$$

$$R_1(i_2 - i_1) + R_3(i_2) + R_L(i_2 - i_3) = 0$$

$$R_2(i_3 - i_1) + R_L(i_3 - i_2) + R_4(i_3) = 0$$

i_1	i_2	i_3	
$R_1 + R_2$	$-R_1$	$-R_2$	10
$-R_1$	$R_1 + R_3 + R_L$	$-R_L$	0
$-R_2$	$-R_L$	$R_2 + R_L + R_4$	0

GR

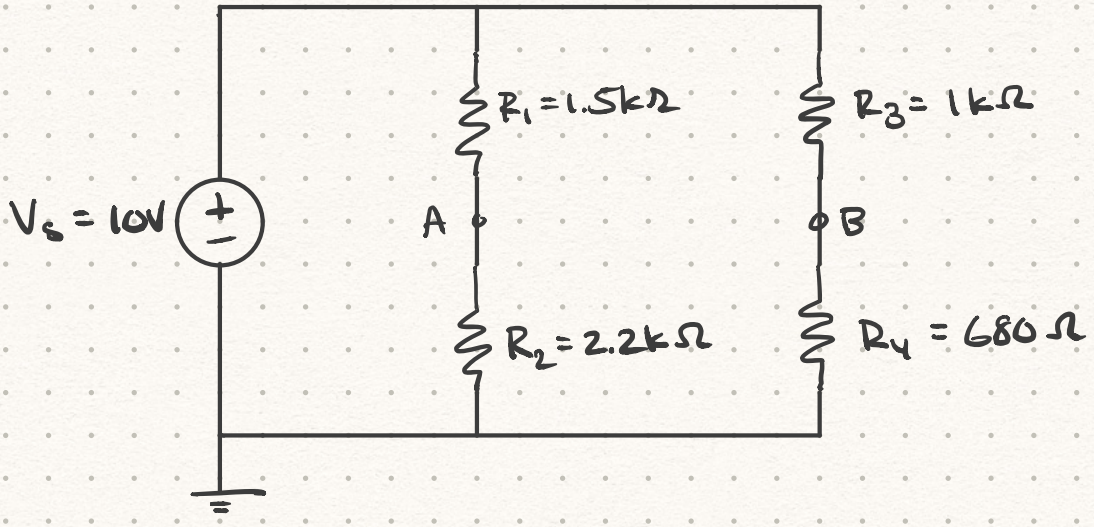


$$\frac{V_A}{R_2} + \frac{V_A - V_S}{R_1} + \frac{V_A - V_B}{R_L} = 0$$

$$\frac{V_B}{R_4} + \frac{V_B - V_S}{R_3} + \frac{V_B - V_A}{R_L} = 0$$

V_A	V_B	
$\frac{1}{R_2} + \frac{1}{R_1} + \frac{1}{R_L}$	$-\frac{1}{R_L}$	$\frac{V_S}{R_1}$
$-\frac{1}{R_L}$	$\frac{1}{R_4} + \frac{1}{R_3} + \frac{1}{R_L}$	$\frac{V_S}{R_3}$

PART B



$$R_{TH} = R_1 \| R_2 + R_3 \| R_4$$
$$= 1296.7\Omega$$

$$\frac{V_A - V_S}{R_1} + \frac{V_A}{R_2} = 0$$

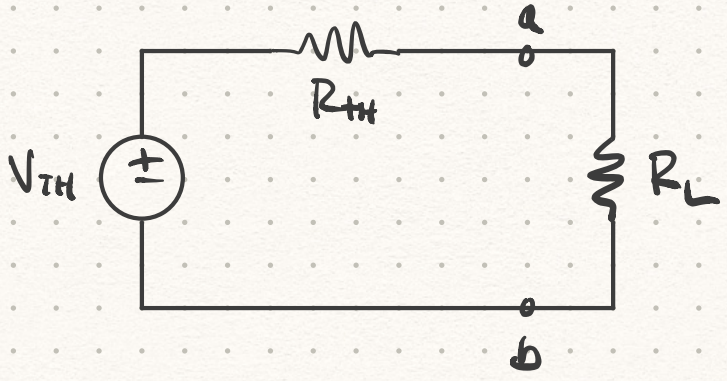
$$V_A\left(\frac{1}{R_1} + \frac{1}{R_2}\right) = \frac{V_S}{R_1} \rightarrow V_A = \frac{V_S}{R_1}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$$

$$\therefore \quad V_B\left(\frac{1}{R_3} + \frac{1}{R_4}\right) = \frac{V_S}{R_3} \rightarrow V_B = \frac{V_S}{R_3}\left(\frac{1}{R_3} + \frac{1}{R_4}\right)^{-1}$$

$$\frac{\frac{1}{R_1}}{\frac{1}{R_1} + \frac{1}{R_2}} \cdot \frac{R_1}{R_1} = \frac{\frac{R_1}{R_1}}{\frac{R_1}{R_1} + \frac{R_1}{R_2}} = \frac{1}{1 + \frac{R_1}{R_2}} \cdot \frac{R_2}{R_2} = \frac{R_2}{R_2 + R_1}$$

ends up just being Votage dividers

PART C:



Voltage divider: $V_{AB} = \frac{R_L}{R_L + R_{TH}} \cdot V_{TH}$