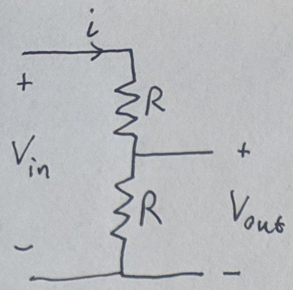
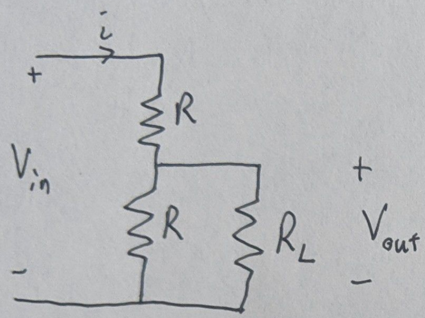
3.



$V_{in} = i(2R)$

$V_{out} = iR = V_{in}/2$

4.



$V_{out} = i \frac{RR_L}{R+R_L}$ $\frac{RR_L}{R+R_L} = R\left(\frac{R_L}{R+R_L}\right) < R$

$V_{in} = i\left(R + \frac{RR_L}{R+R_L}\right) > 2i \frac{RR_L}{R+R_L} = 2V_{out}$

So V_{out} decreases, as $V_{out} < \frac{V_{in}}{2}$ now

5. Ideally, $V_{out} = V_{in}/2 \Rightarrow i\left(R + \frac{RR_L}{R+R_L}\right) = i(R+R)$ so

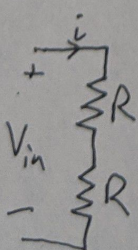
$\frac{RR_L}{R+R_L} \approx R$. $\frac{RR_L}{R+R_L} = \frac{1}{\frac{1}{R}+\frac{1}{R_L}}$. <u>For $R << R_L$</u>, $\frac{1}{R} >> \frac{1}{R_L}$, so $\frac{1}{R}+\frac{1}{R_L} \approx \frac{1}{R}$

and $\frac{RR_L}{R+R_L} \approx R$. Choose <u>R small</u>.

6. $i_L = V_{out}/R_L = \left(\frac{iRR_L}{R+R_L}\right)/R_L = \frac{iR}{R+R_L}$. $i = \frac{V_{in}}{\left(R + \frac{RR_L}{R+R_L}\right)}$, so

$i_L = \frac{V_{in}R}{(R+R_L)\left(R + \frac{RR_L}{R+R_L}\right)} = \frac{V_{in}}{R+2R_L}$. as R decreases, i_L <u>increases</u>

7. Unloaded:



$p = V_{in} i = V_{in}\left(\frac{V_{in}}{R}\right) = \frac{V_{in}^2}{R}$, so as R decreases

p <u>increases</u>