1. Voltage Divider

(a) Find the voltage $V_R$ and current $i_R$ in the following circuits. Use KCL/KVL and Ohm's law.

i. ![Circuit i]

ii. ![Circuit ii]

iii. ![Circuit iii]

iv. ![Circuit iv]

v. ![Circuit v]

vi. ![Circuit vi]

(b) Find the resistance $R$ that achieves the voltage $V_R$. What is the current $i_R$?
(c) Using the resistance $R$ from the last part (b. ii), what happens to the output voltage $V_R$ (and the current $i_R$) if we attach a $R_L$ of $8 \text{k}\Omega$ to the output as depicted in the following circuit:

![Circuit Diagram](image)

(d) What if $R_L$ is $\frac{8}{3} \text{k}\Omega$? What if $R_L$ is $80 \text{k}\Omega$?

(e) Say that we want to support values for $R_L$ in the range of $8 \text{k}\Omega$ to $10 \text{k}\Omega$. We would like to maintain $4 \text{V}$ across this resistor, $R_L$. How can we approximately achieve this by setting $R_1$ and $R_2$ in the following circuit?

![Circuit Diagram](image)