Lecture 3

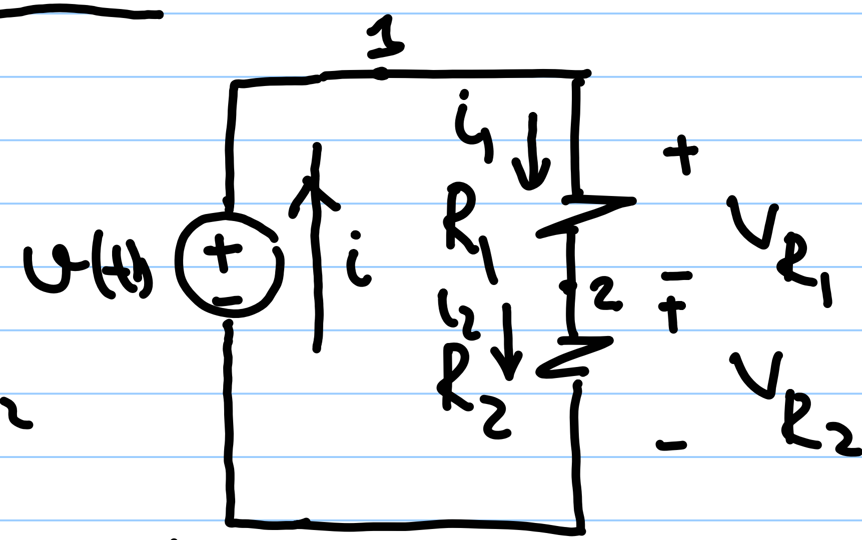
From Section 2.3 of Textbook

Solve E2.8 and E2.9

solve 2.24, 2.29, 2.30, 2.32, 2.37

Note Title 9/12/2007

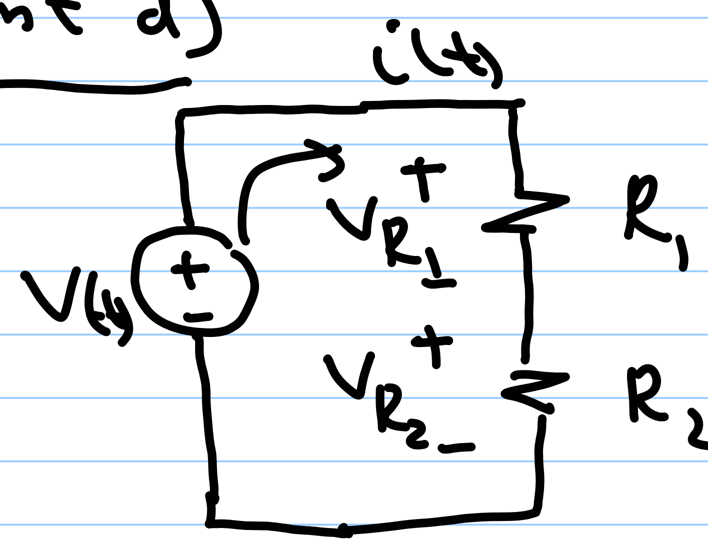
Voltage Divider



* Using Ohm's law we want to find V_{R_1} and V_{R_2}
* apply KCL at node 1 we get $i = i_1$
* Similarly, apply KCL at node 2 $\Rightarrow i_1 = i_2$

$i(t) = i_1(t) = i_2(t)$

Voltage Divider (Cont'd)



Applying KVL, we get

$v(t) = V_{R_1} + V_{R_2}$

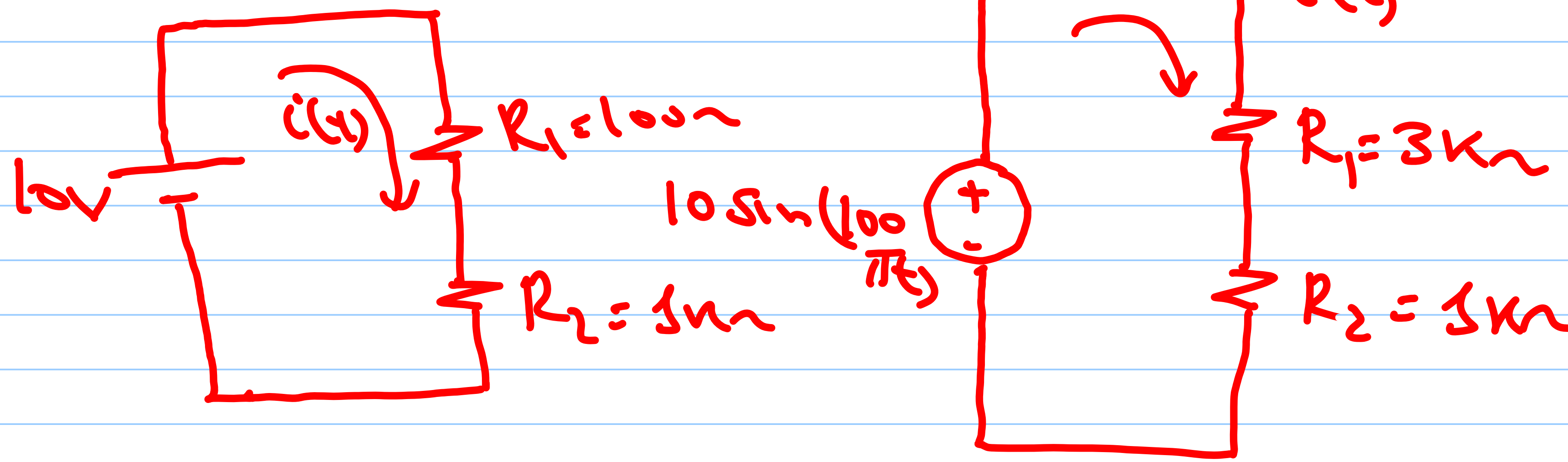
$\Rightarrow v(t) = iR_1 + iR_2$

$\Rightarrow i(t) = \dfrac{v(t)}{R_1 + R_2}$

$V_{R_1} = iR_1 = \left(\dfrac{R_1}{R_1 + R_2}\right) v(t)$

Also, $V_{R_2} = iR_2 = \left(\dfrac{R_2}{R_1 + R_2}\right) v(t)$

Example



For the shown circuit find $i(t)$, V_{R_1}, V_{R_2} and the power dissipated in R_1

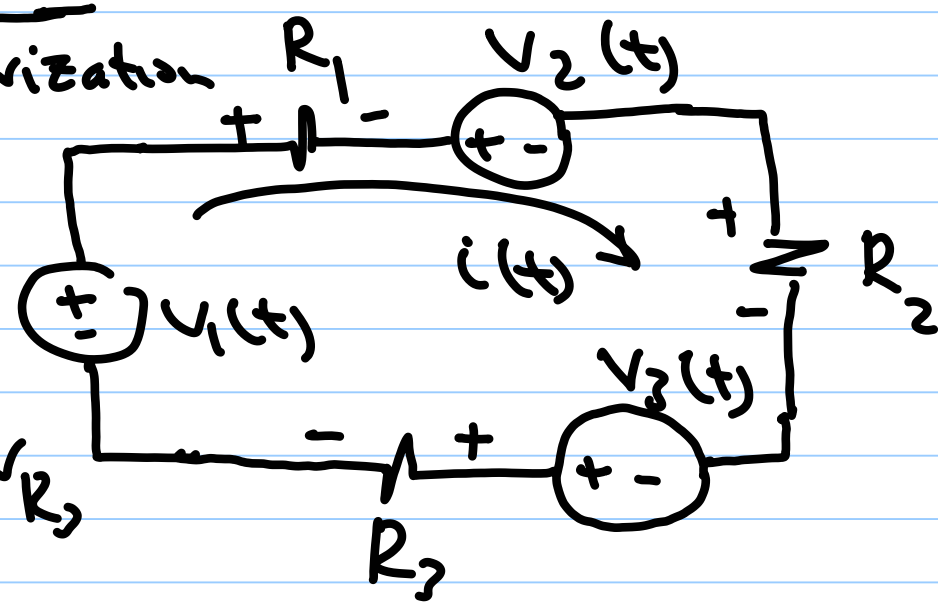
Note Title 9/9/2007

Example

Use Ohm's law, KCL and KVL to find the equivalent resistance of the shown series resistances

Multiple Source Loops

* Assume a current polarization
* Apply KVL



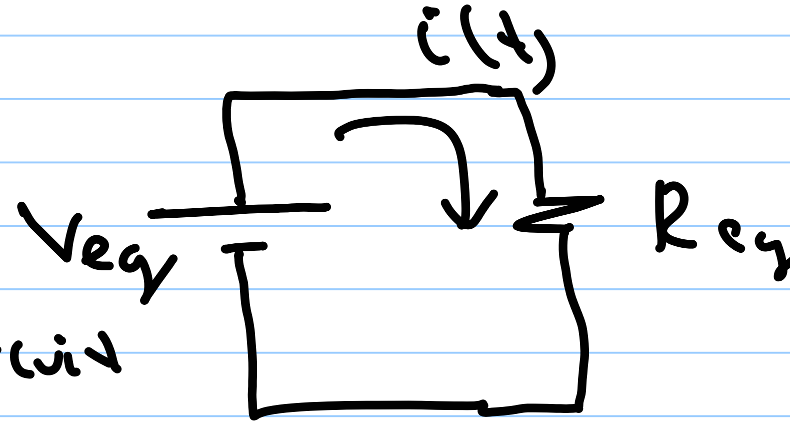
$$v_1(t) + v_3(t) = v_{R_1} + v_2(t) + v_{R_2} + v_{R_3}$$

$$\Rightarrow \underbrace{v_1(t) - v_2(t) + v_3(t)}_{V_{eq}} = i(t)\underbrace{(R_1 + R_2 + R_3)}_{R_{eq}}$$

$$\Rightarrow i(t) = V_{eq} / R_{eq}$$

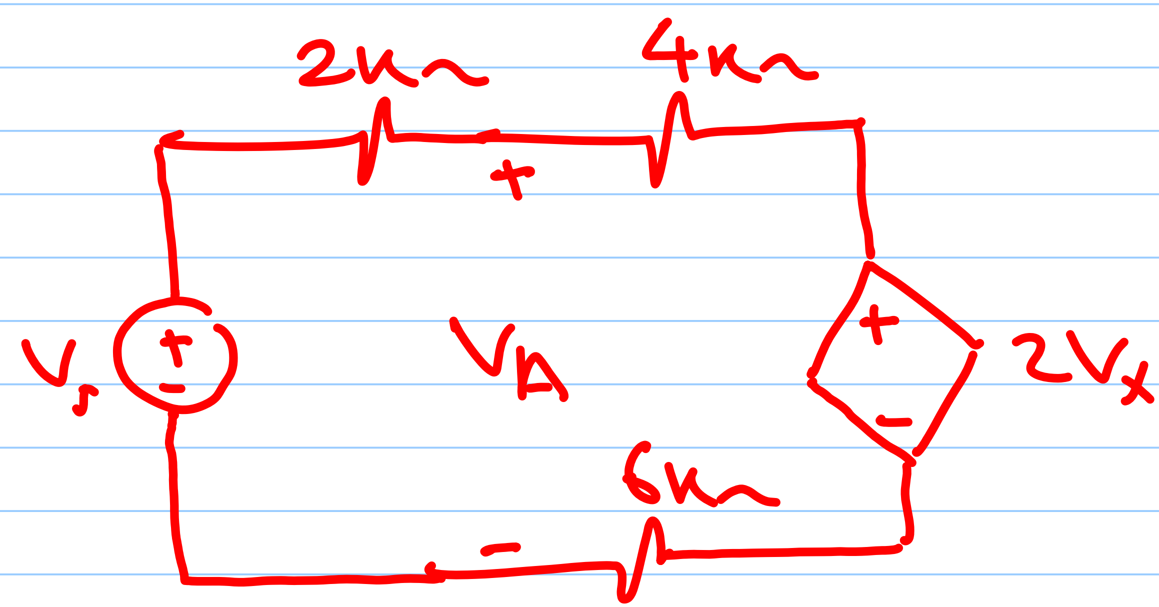
Multiple Source Loops (cont'd)

* equivalent circuit



* This equivalent circuit is useful for current calculation

Example



If $V_A = 12V$, find V_s

Example

A commercial power supply is guaranteed by manufacturer to deliver 5V ± 1% across a load range of 0A to 10A. Find appropriate values of R and V.