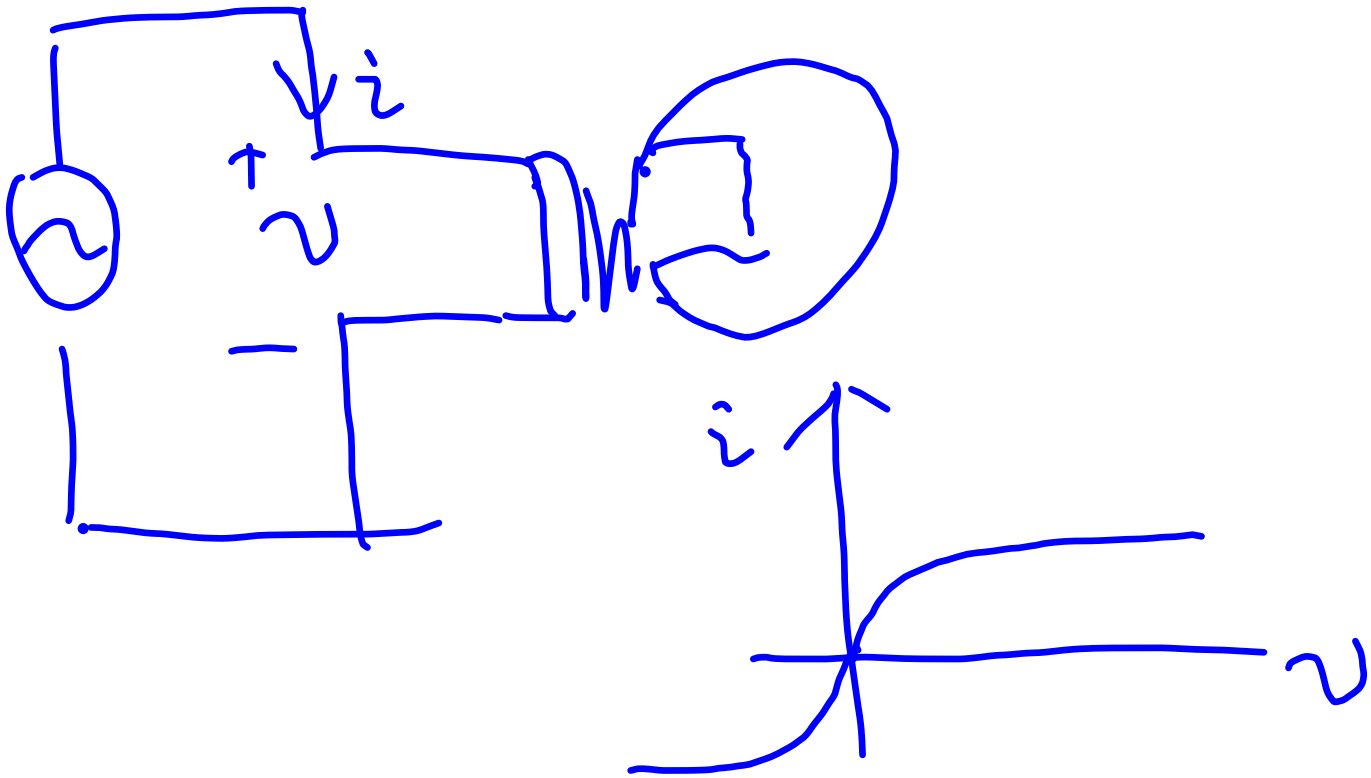
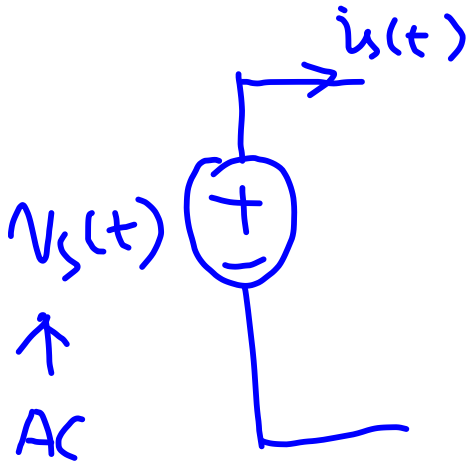
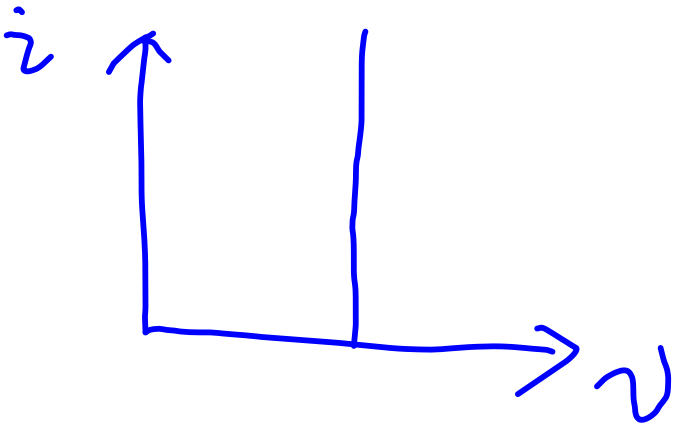
i v Characteristic



Voltage Sources — Batteries

Current Sources — charger

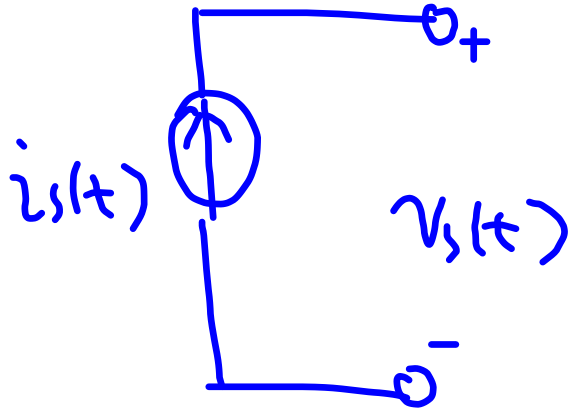




$V_s(t)$

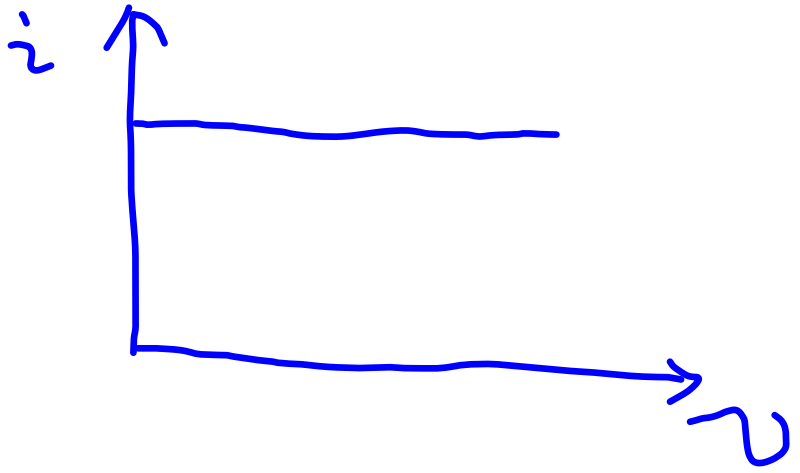
— $V_s(t)$ is known

— $i_s(t)$ is unknown

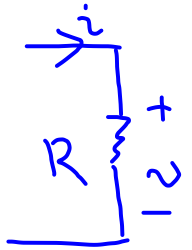


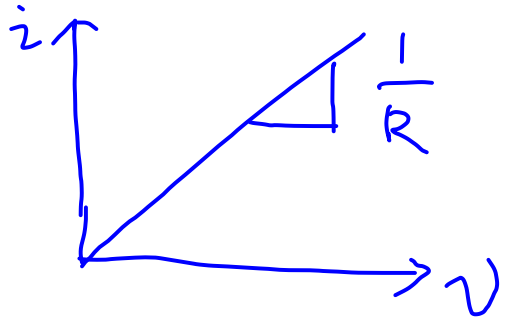
— $i_s(t)$ known

— $v_s(t)$ unknown



Ideal resistor





$R = \frac{v}{i}$ — unit ohm

$V = IR$ ← ohm's law

$G = \frac{1}{R}$ $\quad 1S = 1A/V$

↑

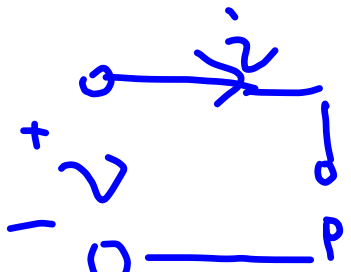
unit: siemens

$P = VI$

$= I^2R = \frac{V^2}{R}$

Example 1

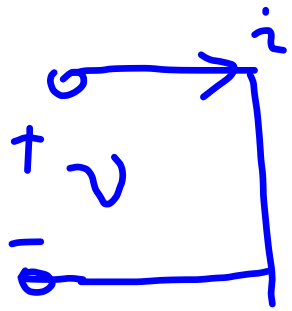
① open Circuit



$R \to \infty$

$i = 0$

② Short Circuit

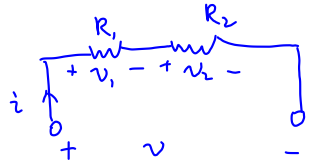


$R = 0$

$v = 0$

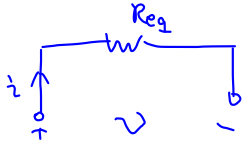
Example 2

Resistors in series



$$\Downarrow$$

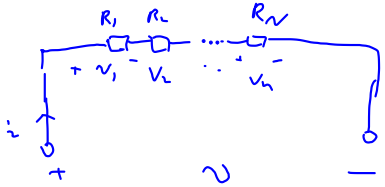
$$R_{eq} = R_1 + R_2$$



$$v_1 = v \cdot \frac{R_1}{R_{eq}}$$

$$v_2 = v \cdot \frac{R_2}{R_{eq}}$$

Voltage divider



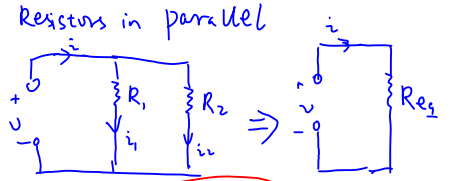
$$\Downarrow$$

$$R_{eq} = \sum_{n=1}^{N} R_n$$

$$v_n = v \cdot \frac{R_n}{R_{eq}}$$

Example 3

Resistors in parallel



$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{R_1 + R_2}{R_1 R_2}$$

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

$$G_{eq} = G_1 + G_2$$

$$i_1 = \frac{v}{R_1} = i \cdot \frac{R_{eq}}{R_1} = i \frac{R_2}{R_1 + R_2}$$

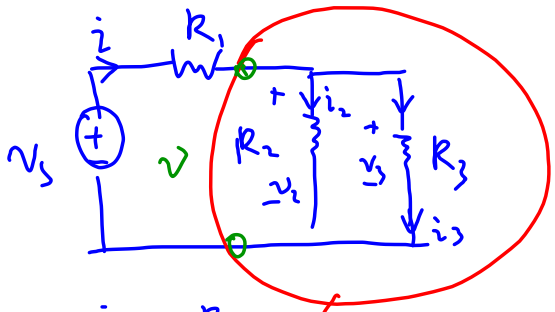
$$i_2 = i \frac{R_1}{R_1 + R_2}$$

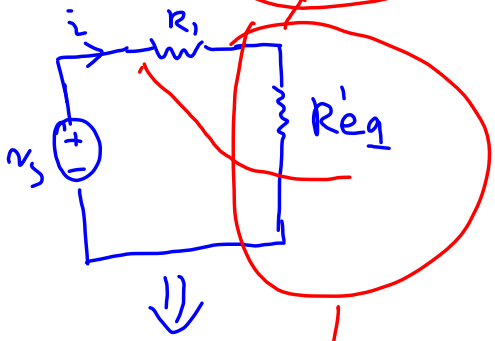
#

$$\frac{1}{R_{eq}} = \sum_{n=1}^{N} \frac{1}{R_n}$$

$$G_{eq} = \sum_{n=1}^{N} G_n$$

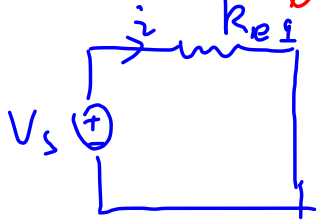
$$i_n = \frac{G_n}{\sum_{n=1}^{N} G_n}$$





Step1

$$R'_{eq} = \frac{R_2 R_3}{R_2 + R_3}$$



step2

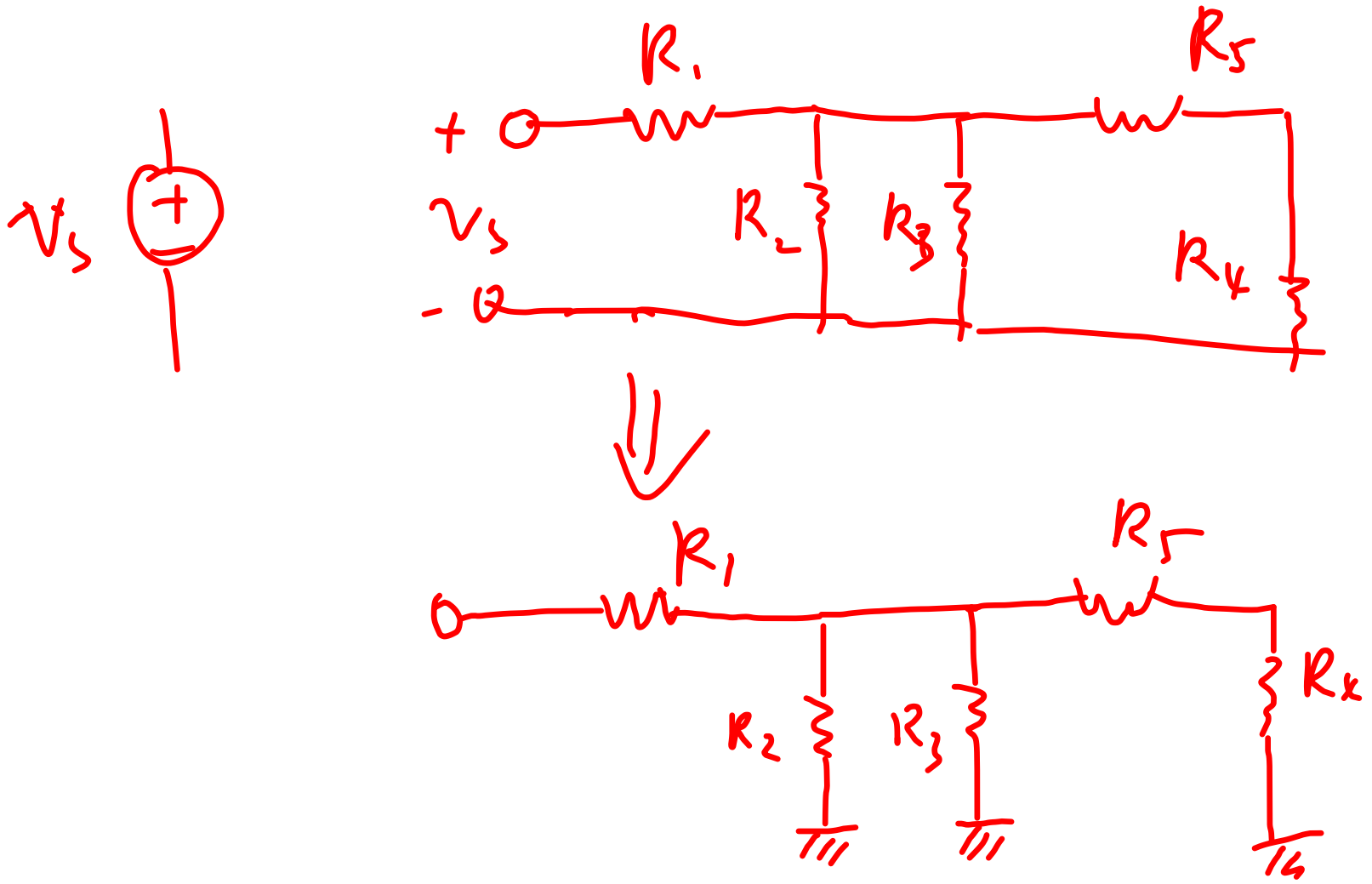
$$R_{eq} = R'_{eq} + R_1$$

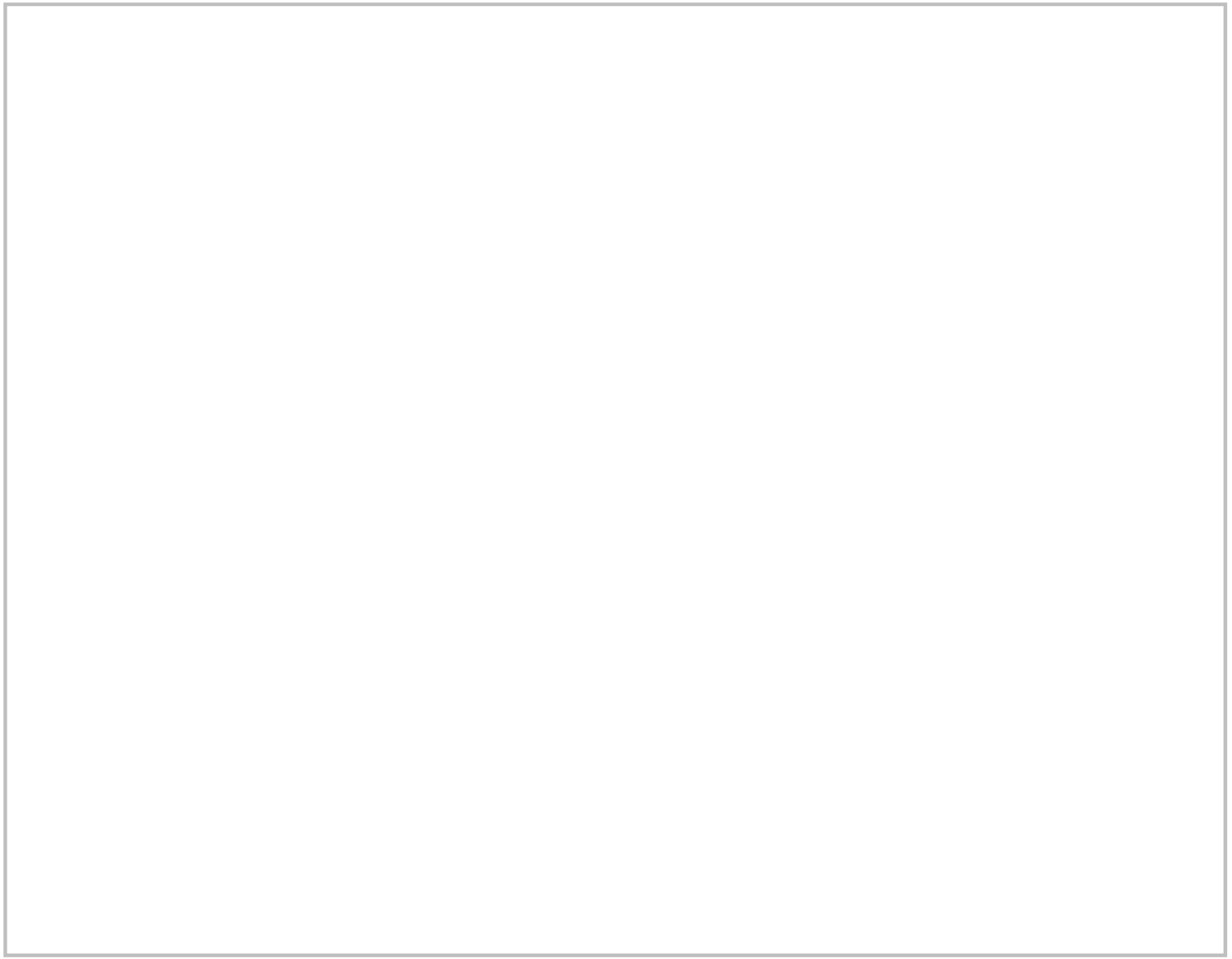
$$i_s = \frac{V_s}{R_{eq}}$$

$$v = V_s \cdot \frac{R'_{eq}}{R_{eq}}$$

$$i_2 = \frac{v}{R_2}$$

$$i_3 = \frac{v}{R_3}$$


V_s
+
V_s
-
R_1
R_2
R_3
R_4
R_5
R_1
R_2
R_3
R_4
R_5



Title: Jan 7-12:55 PM (10 of 10)