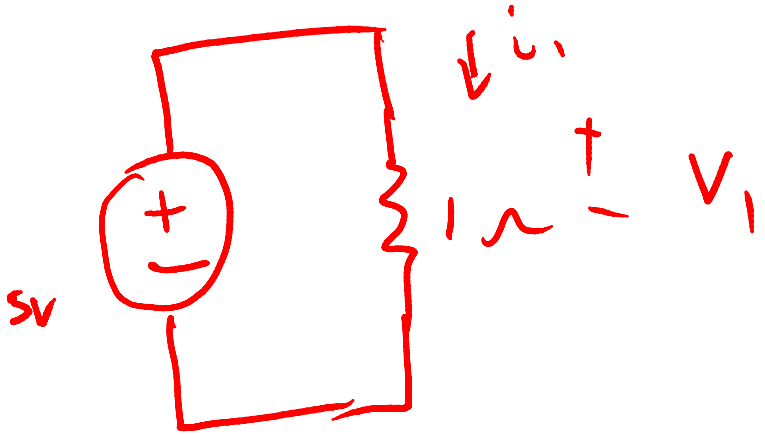
EECS 70A 4/17/2014 Lecture notes

Note:
The first few pages of notes are not in the ppt or pdf file,
because of a computer crash, but the Replay video recording has the notes.

Also, the color version of the notes does not always show in the ppt file
but the pdf file shows the colors.



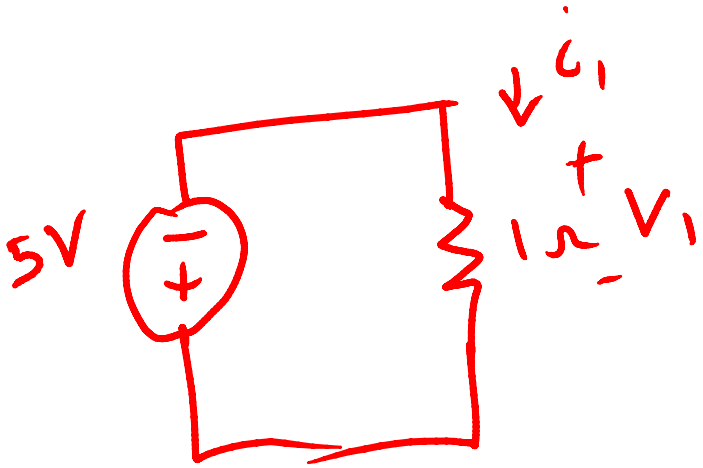
$i_1 = 5A$

$V_1 = 5V$

5V

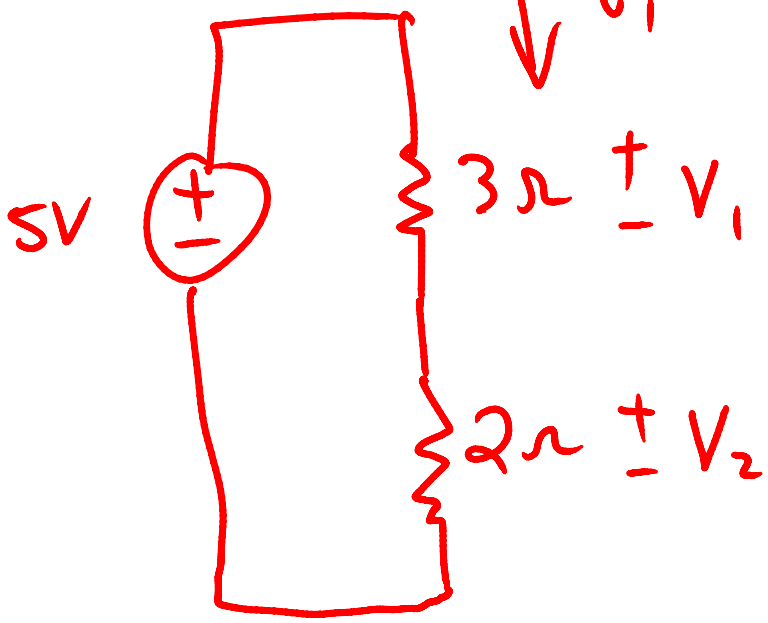
same as

+5V



$i_1 = -5A$

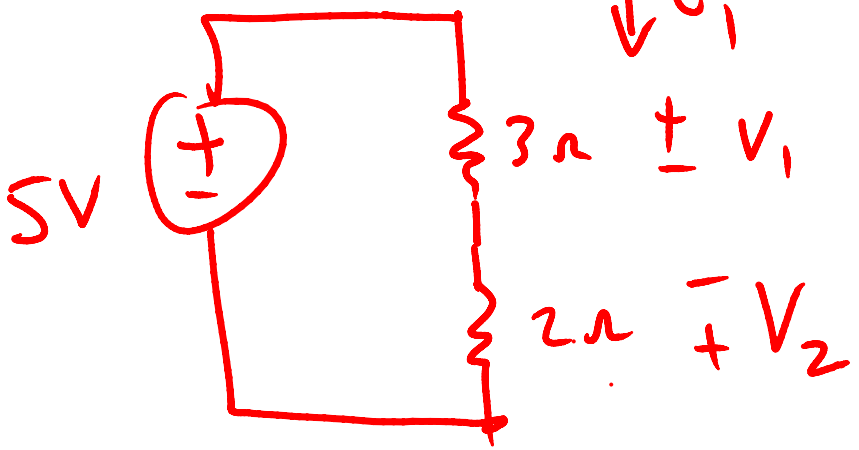
$V_1 = -5V$



$i_1 = 1A$

$V_1 = 3V$

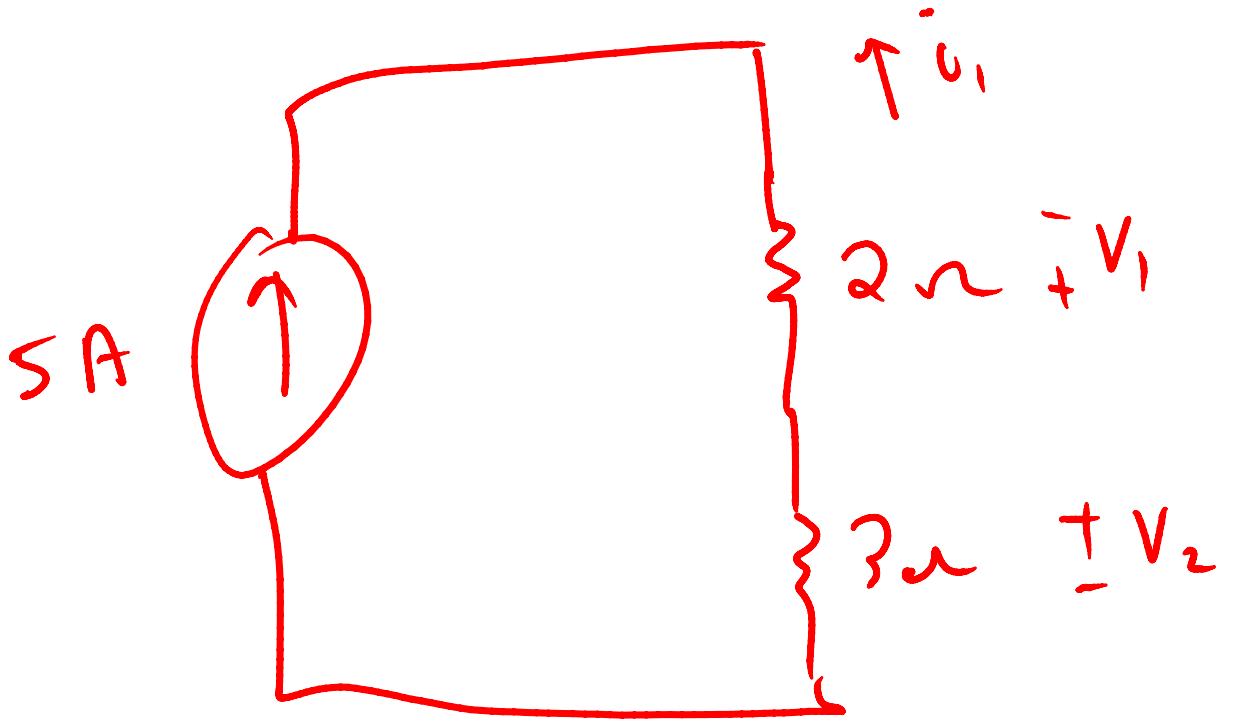
$V_2 = 2V$



$i_1 = 1A$

$V_1 = 3V$

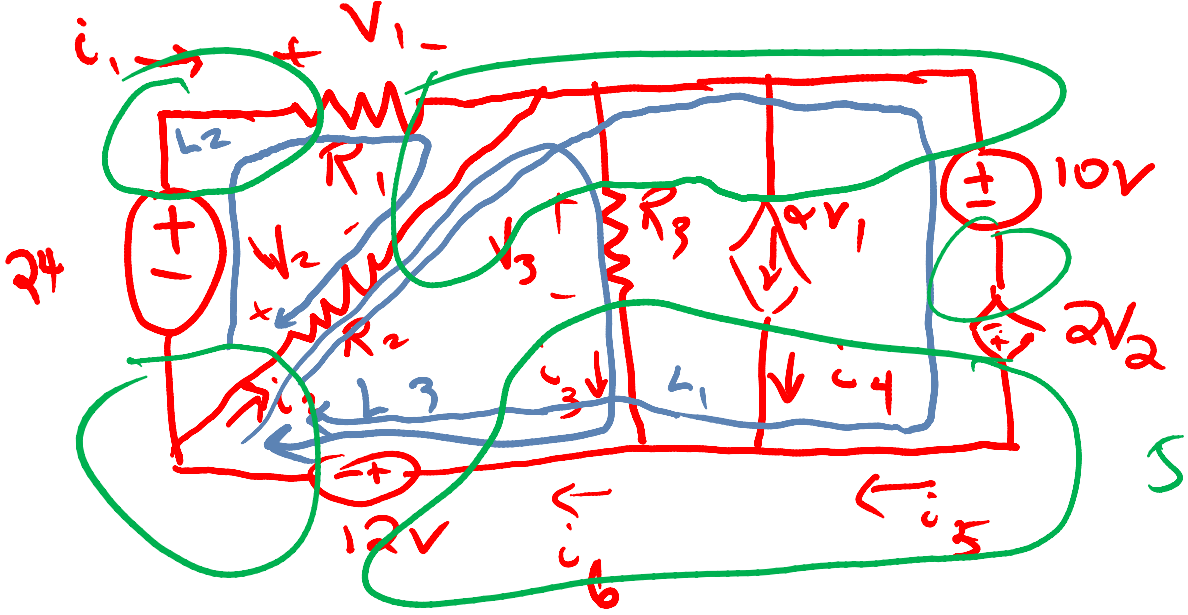
$V_2 = -2V$



$i_1 = -5A$

$V_1 =$ [redacted]
$-10V$

$V_3 =$ [redacted]
$+15V$



$i_6 = i_3 + i_4 + i_5$

$= i_1 + i_2$

$= \frac{46V}{R_1} + \frac{22V}{R_2}$

3 NODES

KVL L1

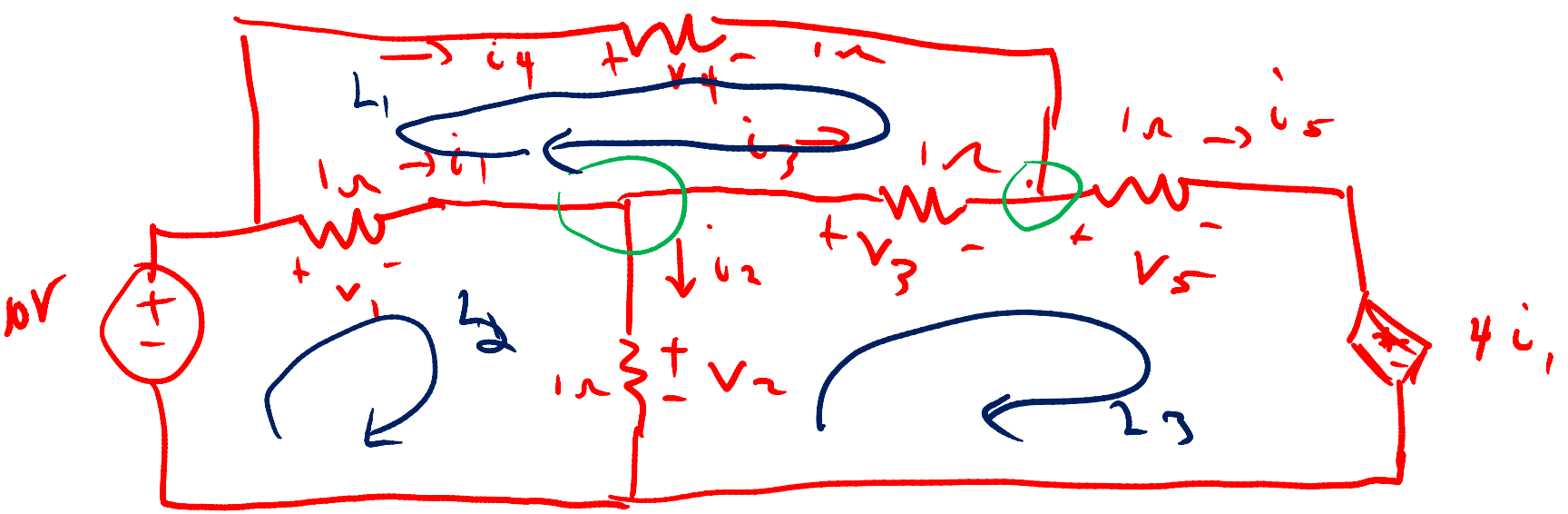
$V_2 + 10V - 2V_2 + 12V = 0 \Rightarrow V_2 = 22V$

L2: $-24V + V_1 - V_2 = 0 \Rightarrow V_1 = 46V$

L3: $V_2 + V_3 + 12V = 0 \Rightarrow V_3 = -34V$

$i_1 = \frac{46V}{R_1}$ $i_2 = \frac{22V}{R_2}$ $i_3 = \frac{-34V}{R_3}$

$i_4 = \alpha\, 46V$ $i_5 = i_6 - i_3 - i_4$ ...



KCL $\quad i_1 = i_2 + i_3$

$$\frac{v_1}{1\Omega} = \frac{v_2}{1\Omega} + \frac{v_3}{1\Omega} \qquad v_1 = v_2 + v_3$$

$i_3 + i_4 = i_5 \qquad v_3 + v_4 = v_5$

KVL

$L_1 \quad -v_1 + v_4 - v_3 = 0$

$L_2 \quad -10 + v_1 + v_2 = 0$

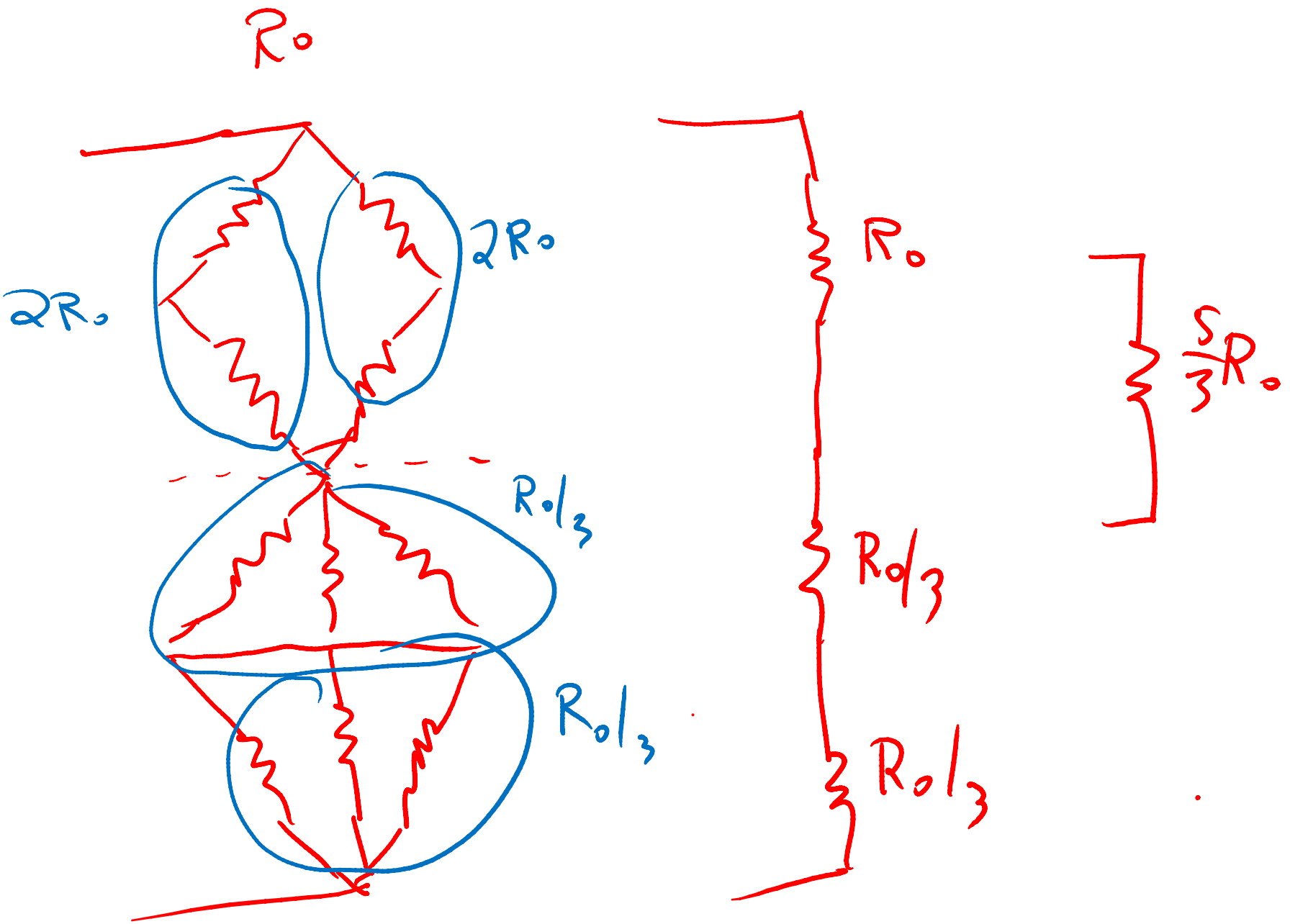
$L_3 \quad -v_2 + v_3 + v_5 + 4i_1 = 0$

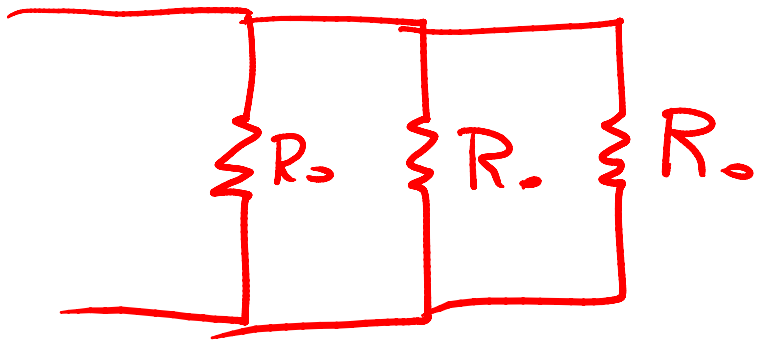
v_1

5 eq.

5 unknown.

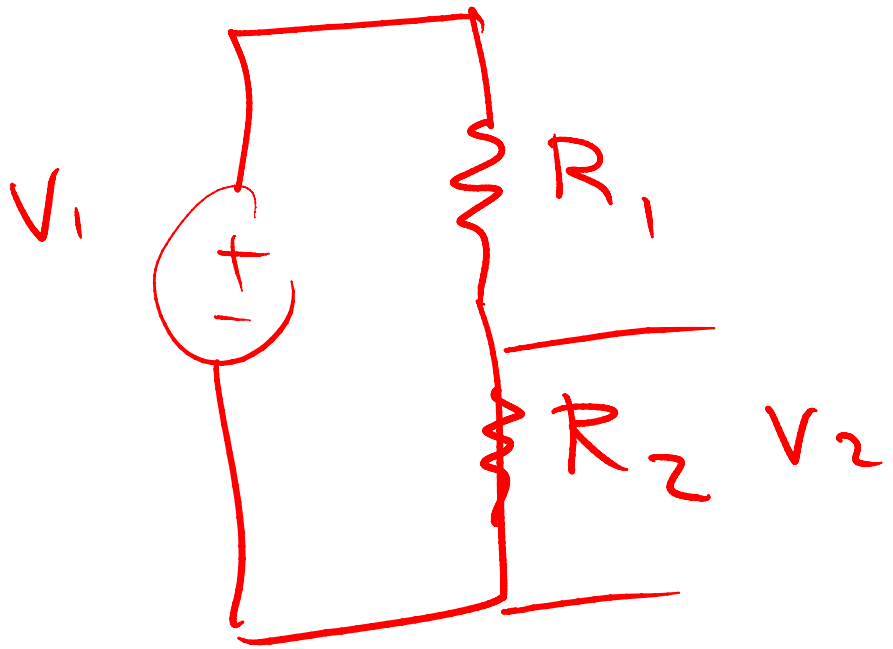
$4i_1 = 4\left(\frac{v_1}{1\Omega}\right)$


R₀
2R₀
2R₀
R₀/3
R₀/3
R₀
R₀/3
R₀/3
5/3 R₀



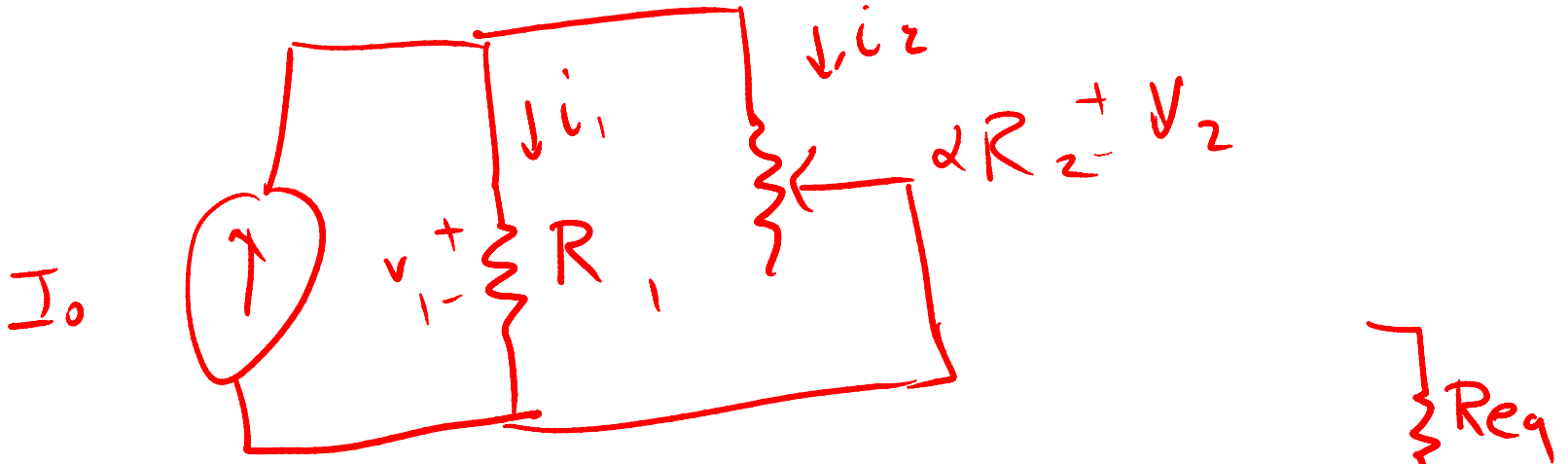
$$\frac{1}{R_{eq}} = \frac{1}{R_0} + \frac{1}{R_0} + \frac{1}{R_0} = \frac{3}{R_0}$$

$$R_{eq} = R_0/3$$



$$V_2 = \frac{R_2}{R_1 + R_2} V_1$$

$$= \frac{R_2}{R_1 + R_2} V_1$$



R_{eq}

$P_1 = v_1 i_1 = (I_0 R_{eq}) i_1 = I_0 (R_1 \| \alpha R_2) i_1$

$= I_0 (R_1 \| \alpha R_2) \frac{v_1}{R_1}$

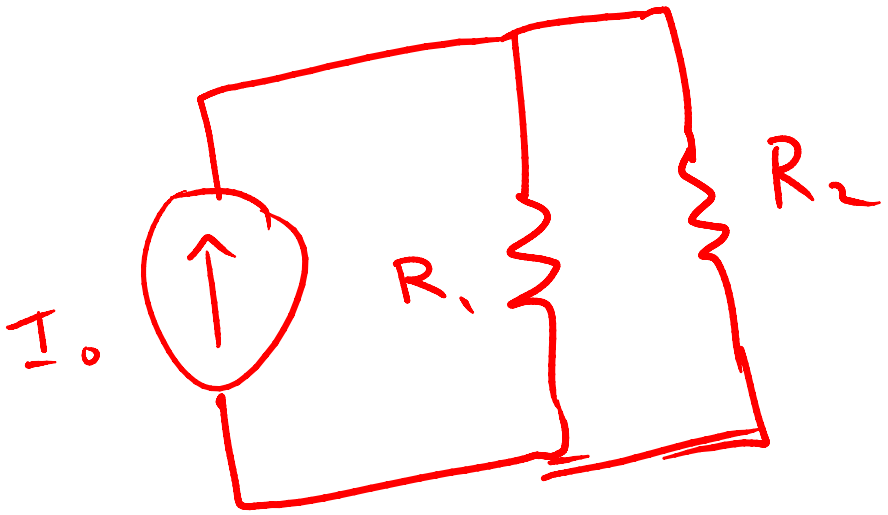
$P_2 = V_2 i_2$

$= I_0 (R_1 \| \alpha R_2) \frac{I_0 (R_1 \| \alpha R_2)}{\alpha R_2}$

$= I_0 (R_1 \| \alpha R_2) \frac{I_0 (R_1 \| \alpha R_2)}{R_1}$

$= \frac{I_0^2}{\alpha R_2} \left(\frac{R_1 \alpha R_2}{R_1 + R_2 \alpha} \right)^2$

$= \frac{I_0^2}{R_1} \left(\frac{R_1 \alpha R_2}{R_1 + R_2 \alpha} \right)^2$



$$I_1 = I_0 \frac{R_2}{R_1 + R_2}$$

$$I_2 = I_0 \frac{R_1}{R_1 + R_2}$$