

EE 220

Lecture 9

JUNE 19, 2014

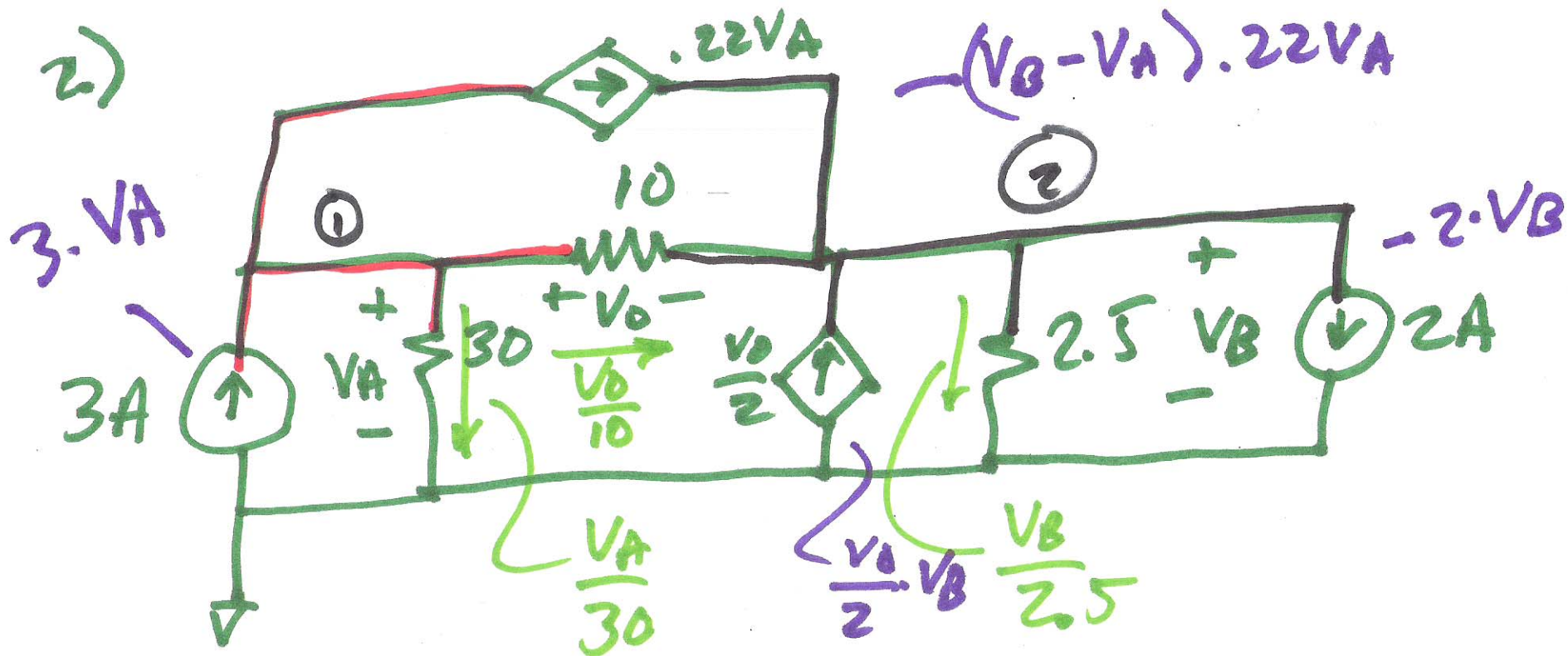
Examples from Ch. 4

Superposition

$$\begin{bmatrix} \frac{1}{30} + .22 & 0 & \frac{1}{10} \\ -.22 & \frac{1}{7.5} & \frac{1}{5} \end{bmatrix} \begin{bmatrix} V_A \\ V_B \\ V_O \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$$

$$\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \begin{bmatrix} V_A \\ V_B \\ V_O \end{bmatrix} = \begin{matrix} a \cdot V_A + b \cdot V_B + \\ c \cdot V_O \end{matrix}$$

1)



a)

① $\frac{V_A}{30} + \frac{V_0}{10} + .22V_A - 3 = 0$

② $\frac{V_B}{2.5} + 2 - \frac{V_0}{2} - .22V_A - \frac{V_0}{10} = 0$

$-V_A + V_0 + V_B = 0$

$V_0 = V_A - V_B$

$$.253 V_A + \frac{V_A - V_B}{10} - 3 = 0$$

$$-.22 V_A + \frac{V_B}{2.5} - \frac{V_A - V_B}{2} - \frac{V_A - V_B}{10} + 2 = 0$$

$$.353 V_A - .1 V_B - 3 = 0$$

$$-.82 V_A + V_B + 2 = 0$$

$$V_B = .82 V_A - 2$$

$$.353 V_A - .082 V_A + .2 - 3 = 0$$

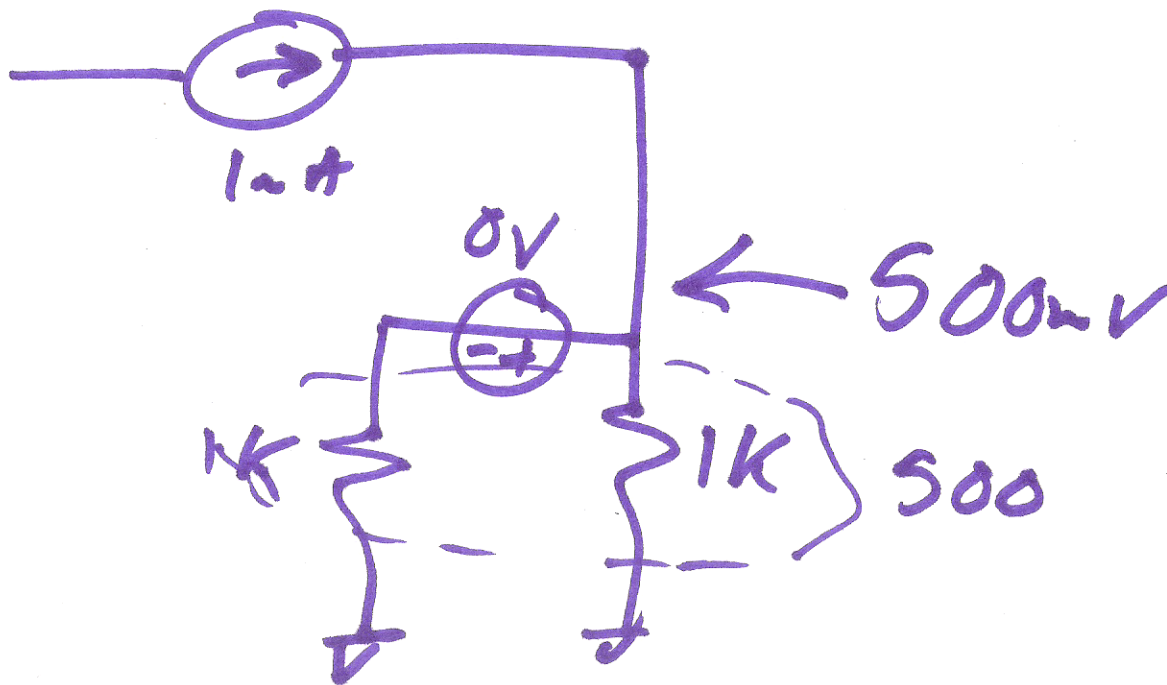
$$.271 V_A - 2.8 = 0$$

$$V_0 = 3.86$$

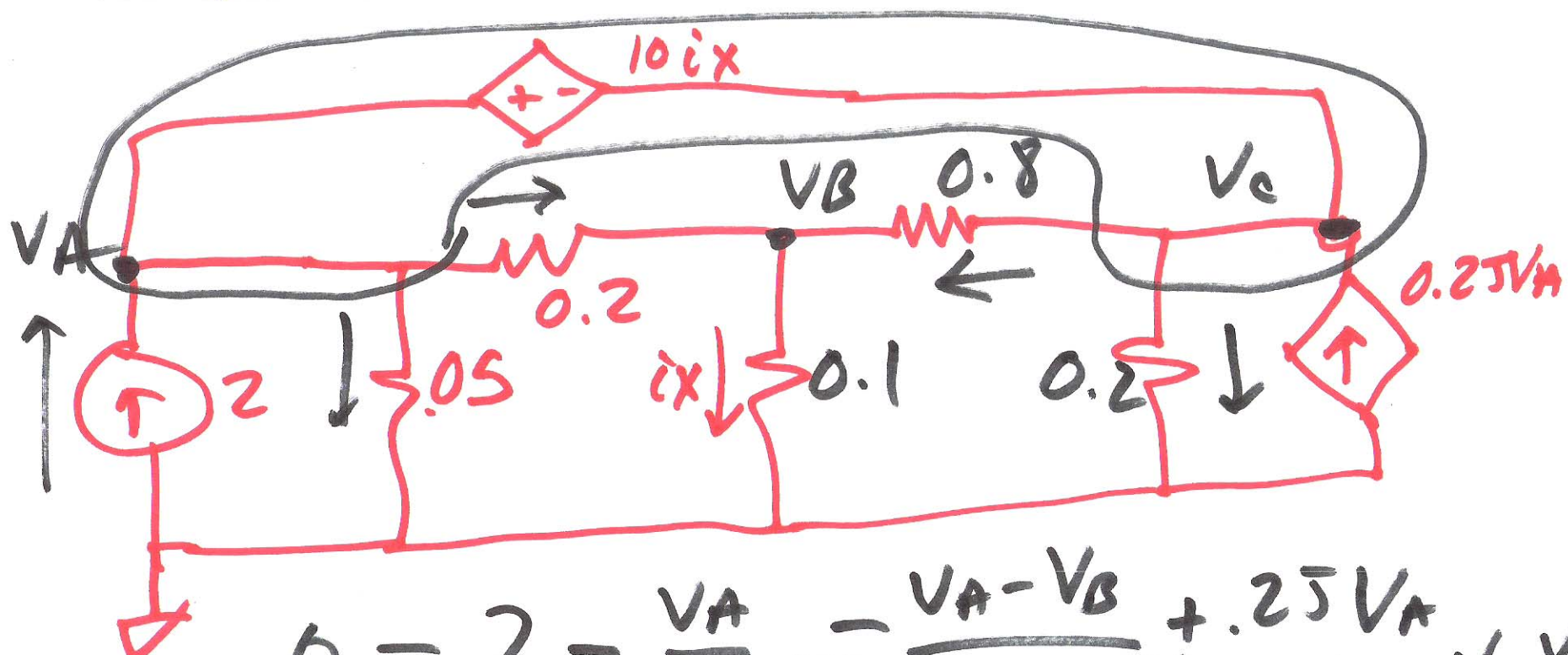
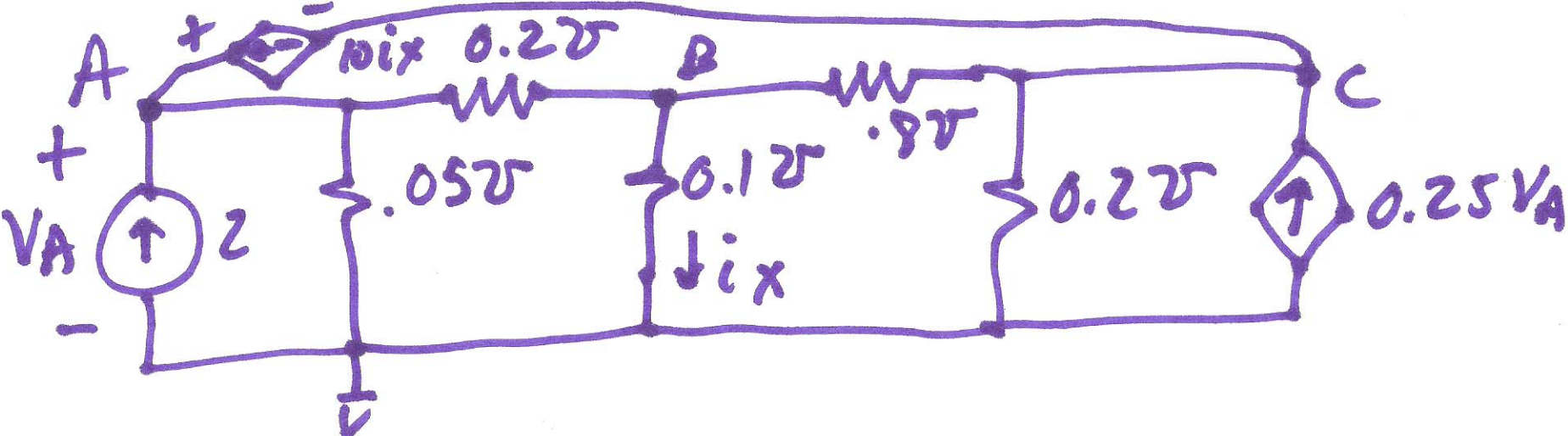
$$V_A = 10.33$$

$$V_B = 6.47$$

3)



4)



$$0 = 2 - \frac{V_A}{(0.5)^{-1}} - \frac{V_A - V_B}{(0.2)^{-1}} + .25V_A - \frac{V_C}{(.2)^{-1}} - \frac{V_C - V_B}{(0.8)^{-1}}$$

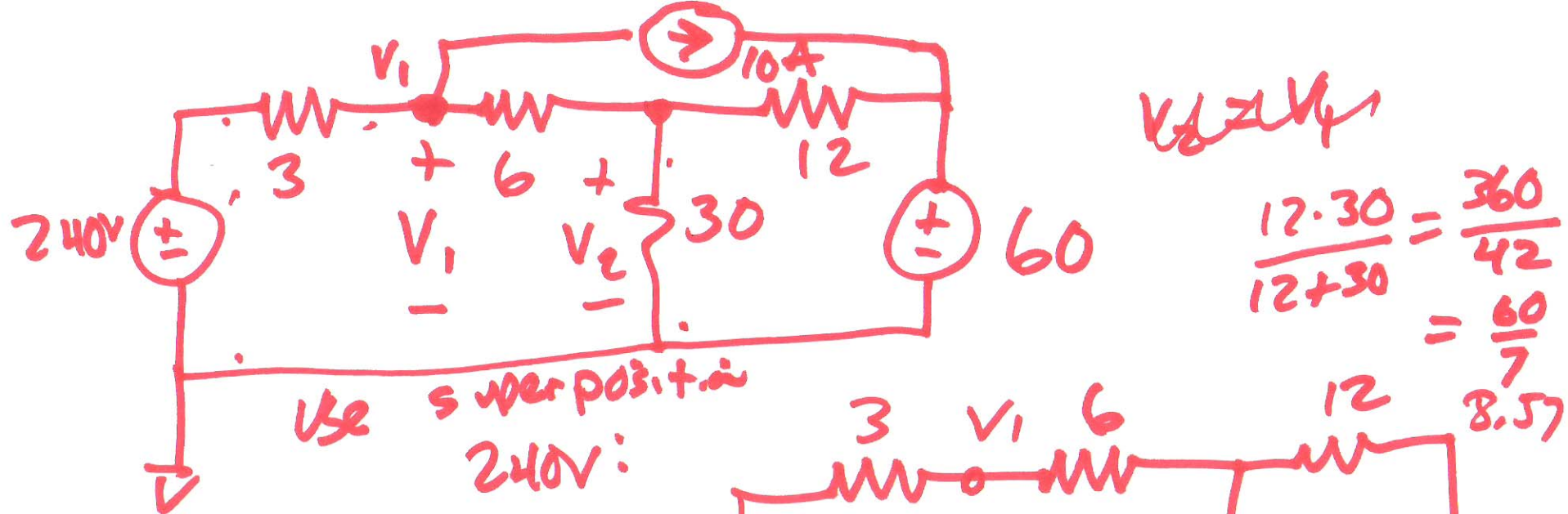
5)

$$2 - V_A(0.05) - (V_A - V_B)(0.2) + .25V_A$$

$$- V_C(0.2) - (V_C - V_B)(0.8) = 0$$

$$0 = (V_A - V_B) \cdot (0.2) - V_B(0.1) + (V_C - V_B)(0.8)$$

$$V_A - V_B = 10i_x = 10 \frac{V_B}{(0.1)^{-1}}$$



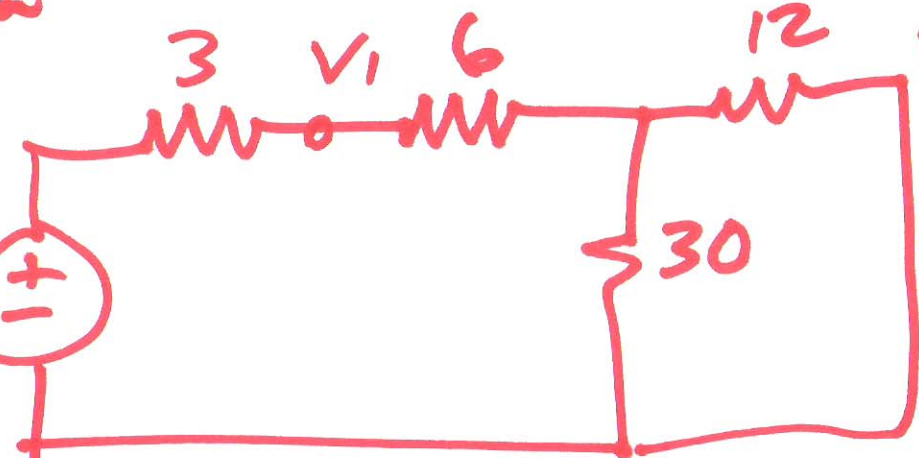
$V_2 = 2V_1$

$$\frac{12 \cdot 30}{12 + 30} = \frac{360}{42}$$

$$= \frac{60}{7}$$

$$= 8.57$$

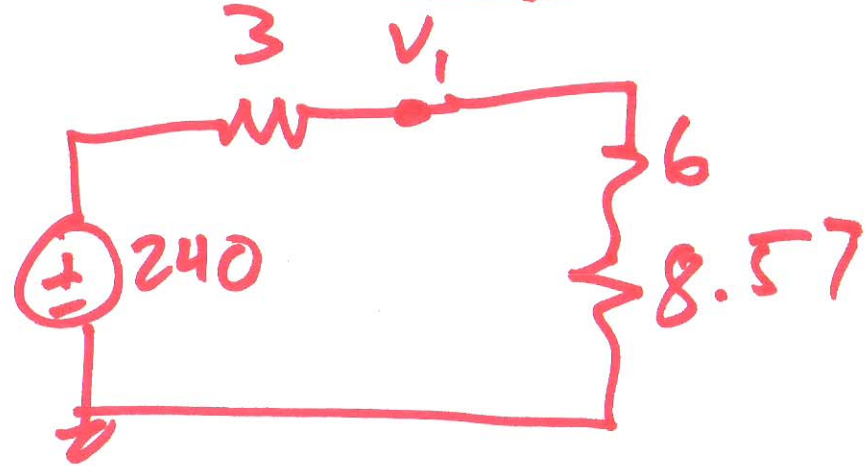
Use superposition
240V:



$$V_1 = \frac{14.57}{14.57 + 3} \cdot 240$$

$V_1 = 199V$

240



10A

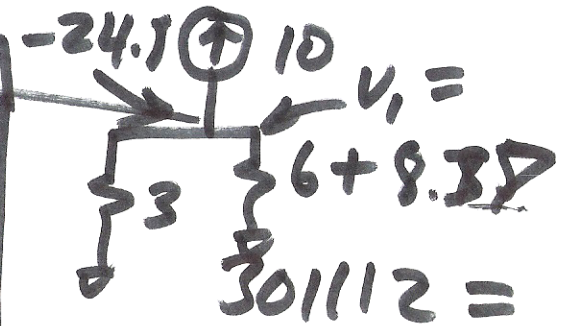
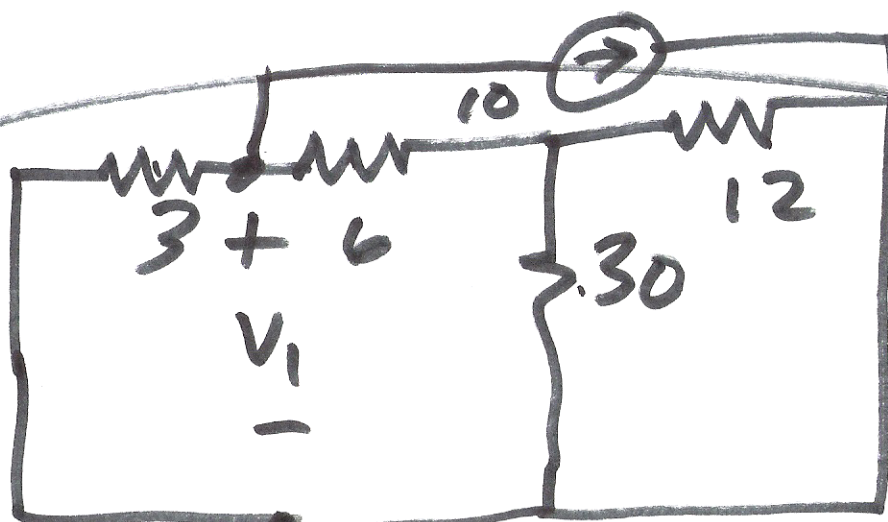
$V_1 = -24.8V$

$V_1 = \frac{-60.3}{11.57}$

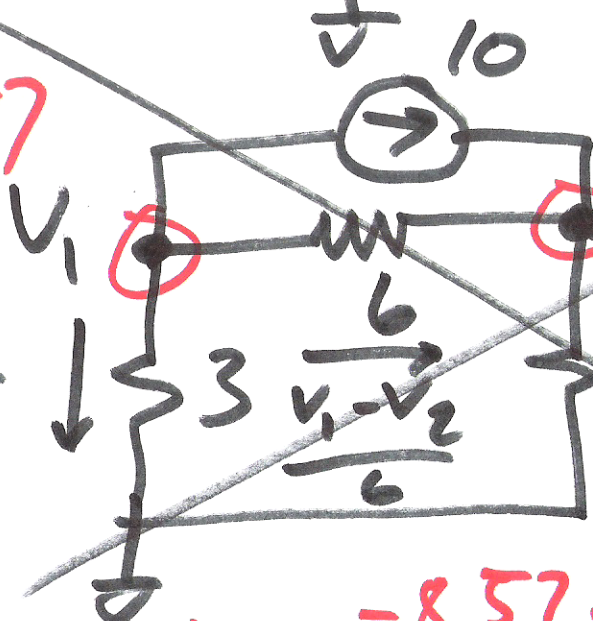
$= \frac{-180}{17.57}$

$= -10.25$

wrong!



$30 \parallel 12 = 8.57 \Omega$
 $\frac{14.57 \times 3}{3 + 14.57} = 2.48$



$\frac{V_1}{3} + \frac{V_1 - V_2}{6} + 10 = 0$

$10 + \frac{V_1 - V_2}{6} = \frac{V_2}{8.57}$

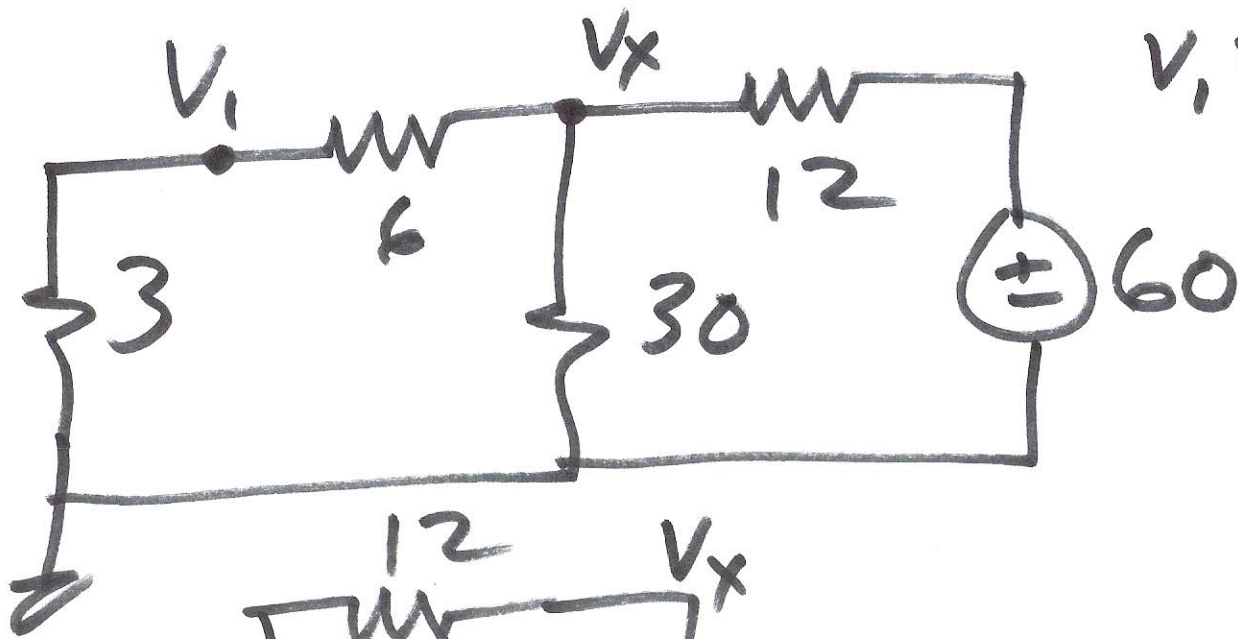
$V_2 = \frac{-8.57}{3} V_1$

$\frac{V_1}{3} = \frac{-V_2}{8.57}$

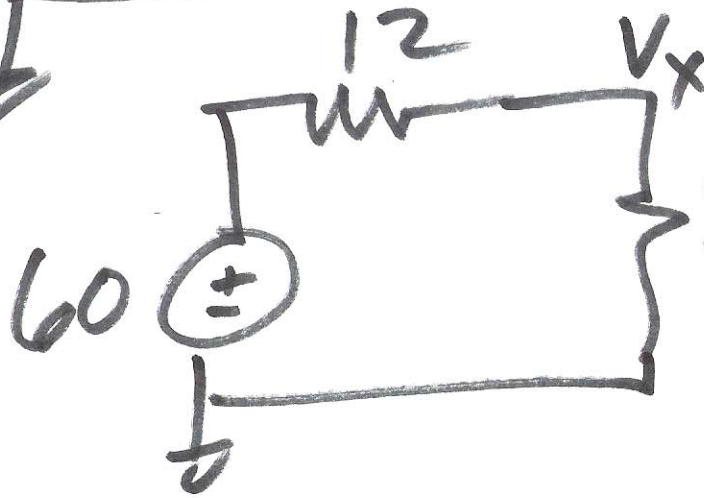
$2V_1 + V_1 - V_2 + 60 = 0$

$3V_1 + \frac{8.57}{3} V_1 = -60$

8)



$$V_1 = \frac{V_x \cdot 3}{3+6} = \frac{V_x}{3}$$



$$30 \parallel 12 = 6.92$$

$$V_x = \frac{6.92}{12+6.92} \cdot 60$$

$$V_x = 21.95$$

$$V_1 = 7.318$$

$$V_{1\text{TOT}} = 7.318 - 24.8 + 19.9 = \underline{\underline{18.51}}$$

9)