Name : ANAS AB. MALEK Section: TA CWRU e-mail: ax9173

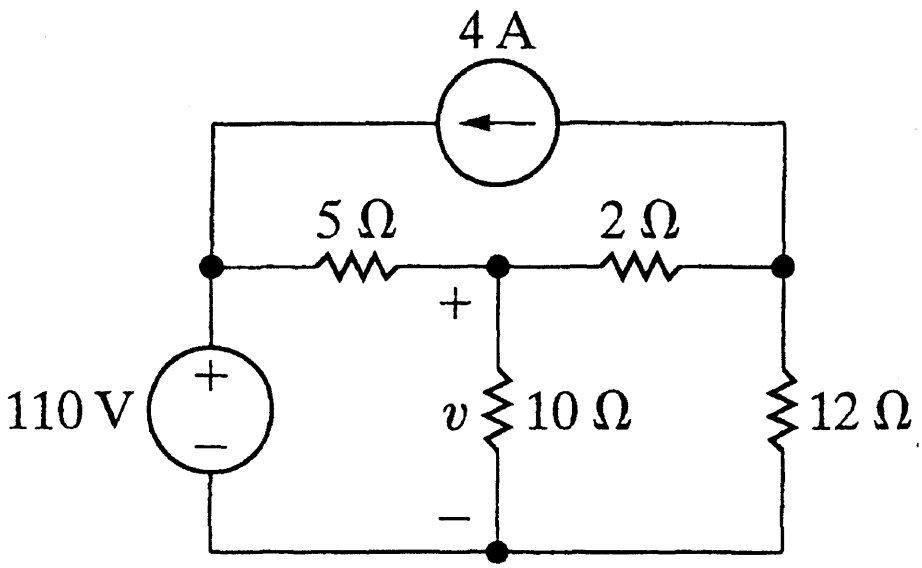
CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

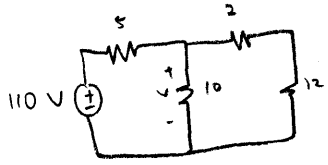
MAKE-UP QUIZ 1 **3/1/05**

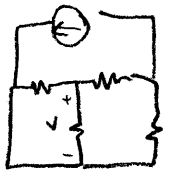
PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

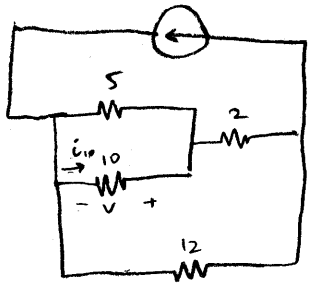
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 10.43 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.23 volts

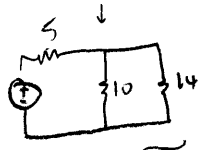
8/10



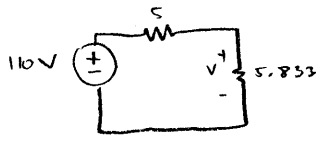








$R_{eq} = \frac{14(10)}{14+10} = 5.833\,\Omega$



$V = \frac{5.833}{5+5.833}(110\text{ V})$

$= 59.23\text{ V}$

$i_{10} = \frac{1/10}{\frac{1}{10}+\frac{1}{5}+\frac{1}{12}}(4\text{ A}) = 1.043\text{ A}$

$V = i_{10} R$

$= (1.043\text{ A})(10\,\Omega)$

$= 10.43\text{ V}$

−2

Name : Anas Ab. Malek Section: TA CWRU e-mail: ax9173

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

mesh 1 $i_1 = 5\,mA$ ✓

mesh 2 $-(40V) + (i_2 - i_1)(2000\Omega) + (i_2 - i_3)4000\Omega = 0$

$-40 + (i_2 - (5\times10^{-3}))(2000) + (i_2 - i_3)4000 = 0$

$6000 i_2 - 4000 i_3 = 50$ ✓

mesh 3 $+(i_3 - i_2)(4000\Omega) + i_3(8000\Omega) - 20 = 0$

$4000 i_3 + 4000 i_2 = 20$

use passive sign convention.

6/10

(c) Solve your equations for v_x and i_x.

$v_x =$ 36V

$i_x =$ 0.002A

$6000 i_2 - 4000 i_3 = 50$ ①

$4000 i_3 + 4000 i_2 = 20$ ②

① + ② $10000 i_2 = 70$

$i_2 = 7\,mA$

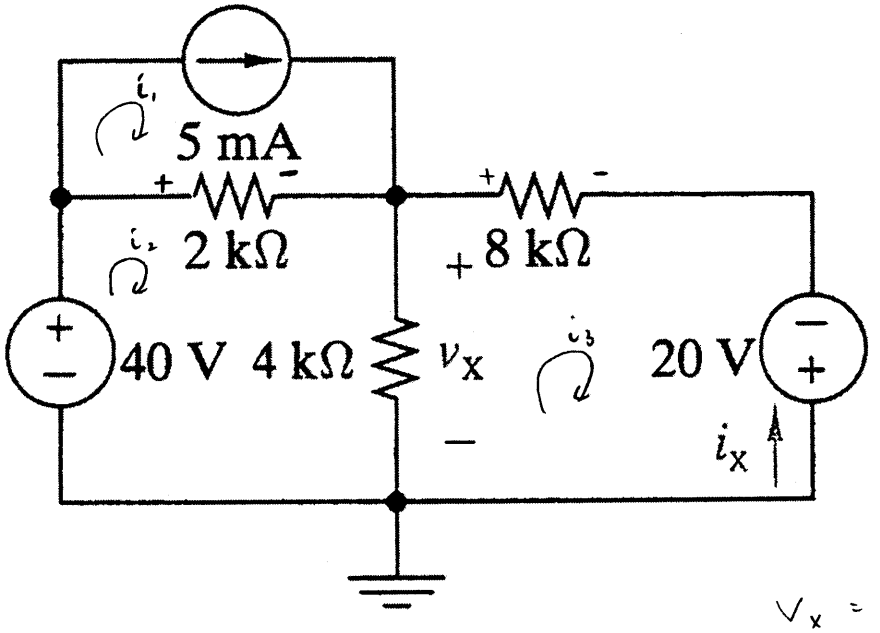
$6000(0.007) - 4000 i_3 = 50$

$i_3 = -2\,mA$

$i_x = -i_3$

$= -(-0.002\,A)$

$= 0.002\,A$



$v_x = (i_2 - i_3)(4000\Omega)$

$= [7\,mA - (-2\,mA)](4000\Omega)$

$= 36V$

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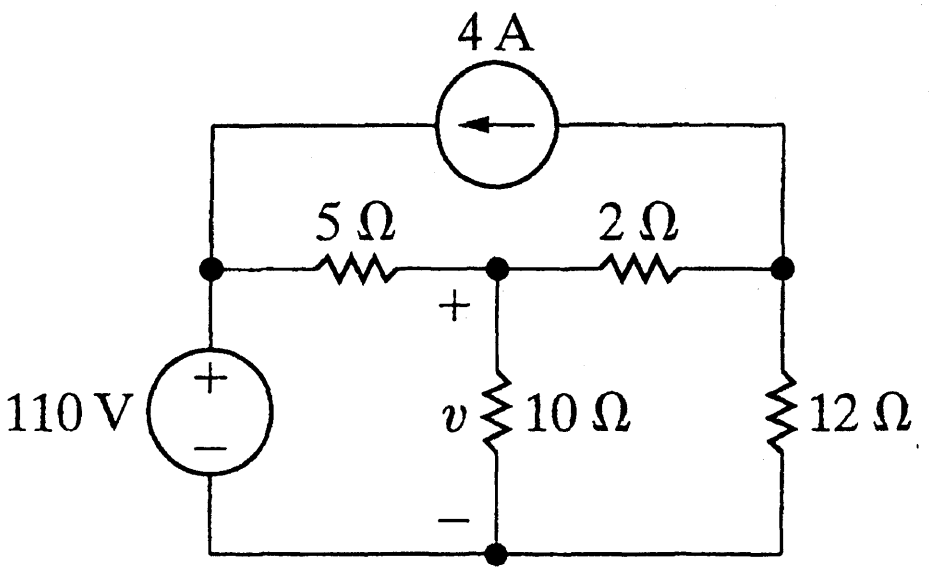
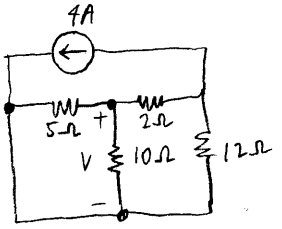
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 4.53 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 37.93 volts

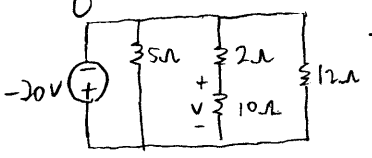
6



V_{110V} = OFF



You cannot do this type of source transform on this circuit



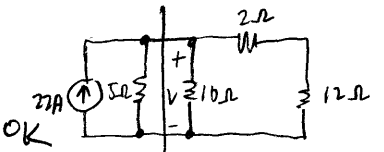
−2

$$i_{4A} = \frac{\frac{1}{10}}{\frac{1}{5}+\frac{1}{10}+\frac{1}{2}+\frac{1}{12}}(4A)$$

i_{4A} = 0.4528 A

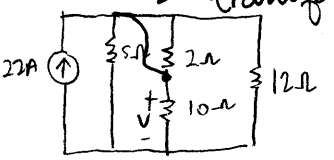
I_s = OFF

$$i = \frac{110V}{5\Omega} = 22A$$



OK

You cannot transform the circuit and reconnect the 5Ω to a different location



−2

$$V_{110V} = \frac{10\Omega}{(5+2+12+10)\Omega} V_s$$

$$V_{110V} = \frac{10\Omega(110V)}{5\Omega+2\Omega+12\Omega+10\Omega}$$

V_s = 110V = 37.93 V

$v_{4A} = (10\Omega)(0.4528A) = 4.528V$

Name : Aqbal Hafeez Ariffin Section: TE CWRU e-mail: ahg8

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

These equations don't make any sense. mesh current means KVL what is $\frac{i}{R}$?

i_1: $i_1 + \frac{i_1 - i_3}{2k\Omega} + \frac{i_1 - i_2}{4k\Omega} = 0 \rightarrow 8i_1 + 4i_1 - 4i_3 + 2i_1 - 2i_2 = 0$

$14i_1 - 2i_2 - 4i_3 = 0$

$7i_1 - i_2 - 2i_3 = 0$

i_3: $5mA - \frac{i_3 - i_1}{2k\Omega} = 0 \rightarrow 10 - i_3 - i_1 = 0$

$i_3 + i_1 = 10$

$i_3 = 10 - i_1$

i_2: $-\frac{i_2 - i_1}{4k\Omega} - i_x = 0$

$-i_2 + i_1 - 4000 i_x = 0$

$i_1 = 4000 i_x + i_2$

$i_2 = 7i_1 - 2i_3$

$i_1 = 4000 i_x + 7i_1 - 2i_3$

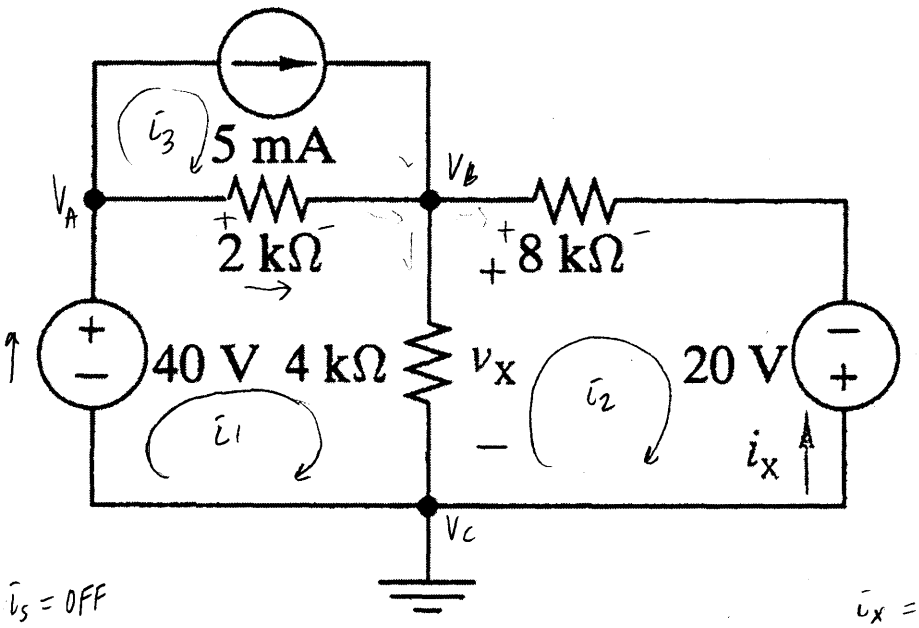
$i_1 = 4000 i_x + 7i_1 - 20 + 2i_1$

$-8i_1 = 4000 i_x - 20$

(c) Solve your equations for v_x and i_x.

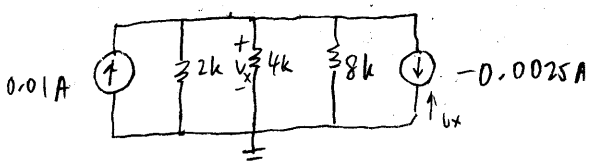
v_x = 8.57 V

i_x = 2.14 A

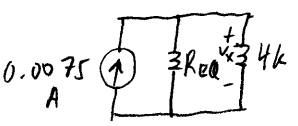


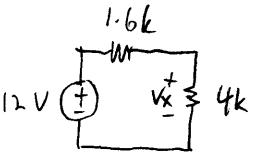
i_s = OFF

$i_x = \frac{v_x}{4k\Omega} = \frac{8.571V}{4k\Omega} =$



$R_{EQ} = \frac{8k(2k)}{8k+2k} = 1600\Omega$





$V_{12V} = V_x = \frac{4k(12V)}{1.6k + 4k} = 8.571V$

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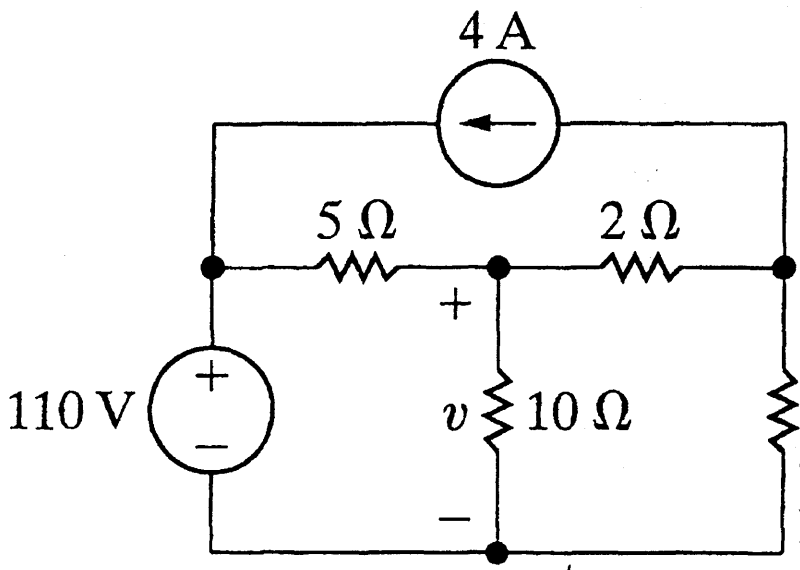
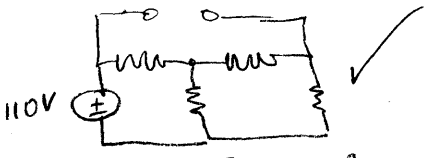
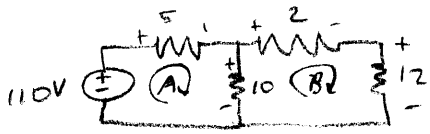
9.5/10.

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = −9.23V (sign) volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = −41.25V volts

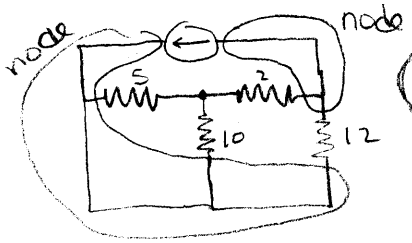


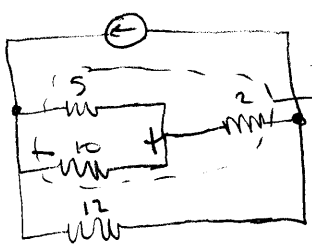
(b) turn off current source → acts as open





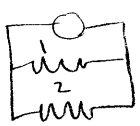
(a) turn off voltage source → acts as short





can all be made Req

$R_{eq} = \frac{1}{\frac{1}{5}+\frac{1}{10}} + 2 = 5.\overline{3}\,\Omega$



current divider

current through 1

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

$= \frac{12\Omega}{5.\overline{3}+12}(4A)$

$= 2.77A$

current through $R_{5,10}$ & R_2 same

$V_{5,10} = i R_{5,10}$

$= 2.77\left(\frac{1}{\frac{1}{5}+\frac{1}{10}}\right)$

$V_{5,10} = 9.23V$

V through 5 & 10 Ω is same

$-110 + 5i_A + 10i_A - 10i_B = 0$

$+10i_B - 10i_A + 2i_B + 12i_B = 0$

sign errors

$4i_B + 10i_A = 0$

$2i_B + 5i_A = 0$

$i_B = -\frac{5i_A}{2}$

$15i_A - 10i_B = 110$

$15i_A - 10\left(-\frac{5}{2}i_A\right) = 110$

$15i_A + 25i_A = 110$

$40i_A = 110$

$i_A = 2.75A$

$i_B = -6.875A$

$v = 10i_A - 10i_B$

$= -41.25V$

Name : _____ Section:_____ CWRU e-mail:_____

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓ theoretically w/supermesh, 4

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

For redrawn circuit

1) $-40V - 10V + 2i_1 + 4i_1 - 4i_2 = 0$

KVL

$6i_1 - 4i_2 = 50V$ OK

...used wrong method.. didn't write current eqns...

2) $+4i_2 + 4i_1 + 8i_2 - 20V = 0$

sign error

$4i_1 + 4i_2 = 20V$

current:

pt A) $\Sigma i = 0$ +in

$-5 - \frac{v_A - v_B}{2} - i_B = 0$

pt B) $5 + \frac{v_A - v_B}{2} - \frac{v_B - 20}{8} - \frac{v_B - 0}{4} = 0$

$i_1 + i_2 = 5 \quad i_1 = (5 - i_2)$ plug in

$6(5 - i_2) - 4i_2 = 50$

$30 - 6i_2 - 4i_2 = 50$

$-10i_2 = 20$

$i_2 = -2mA$

$i_x = -i_2 = 2mA$

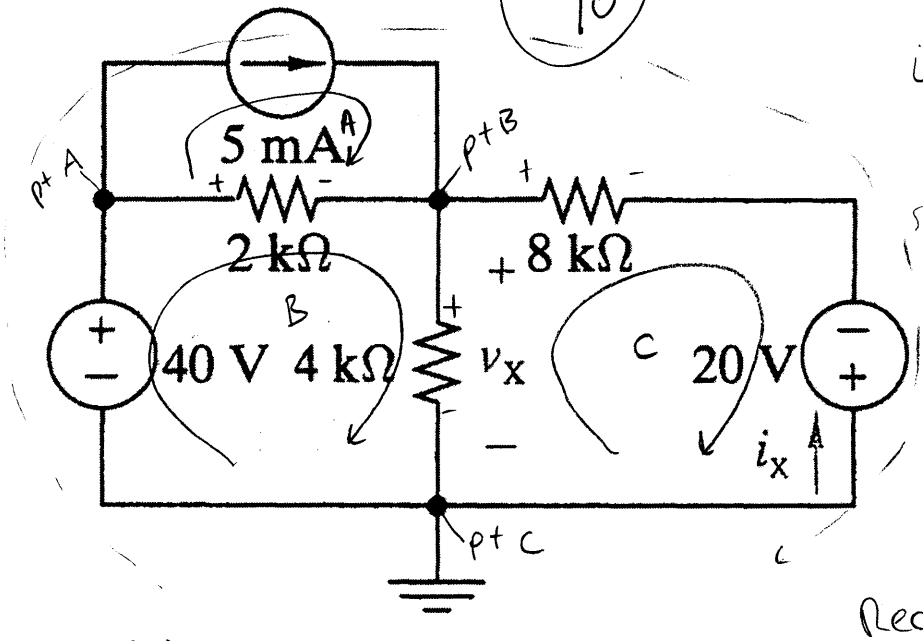
$i_1 = 7mA$

(c) Solve your equations for v_x and i_x.

v_x = 36V

i_x = 2mA

9/10



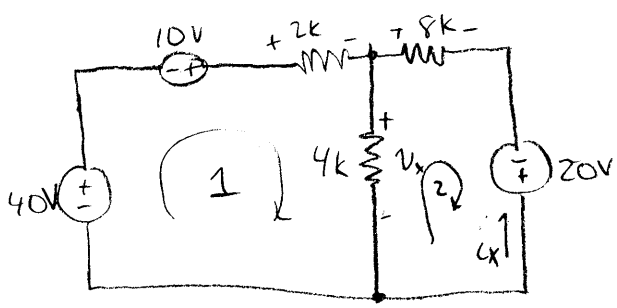
supermesh

$v_x = 4i_1 - 4i_2$

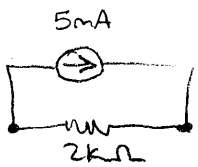
$= 4(7) - 4(-2)$

$v_x = 36V$

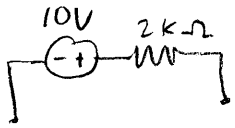
Redrawn circuit:



mesh A



$\Rightarrow$



$V = iR$

$= 5mA\,(2k\Omega)$

$= 10V$

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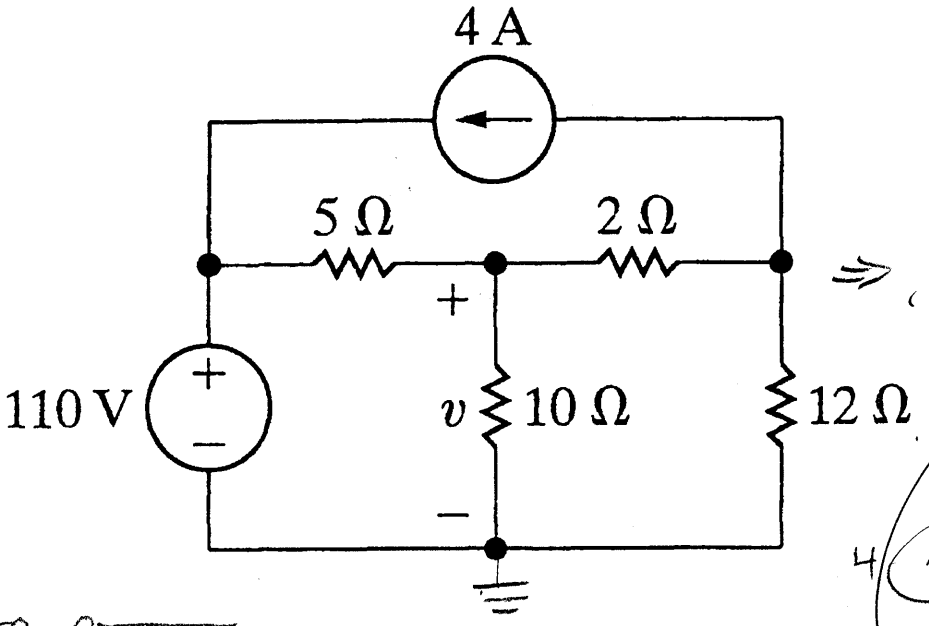
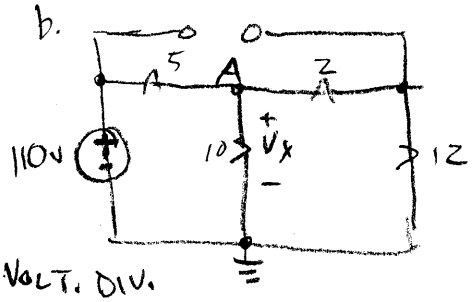
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 40/3 volts

   b. find the contribution to v from the 110V voltage source
      v_{110V} = 220/3 volts

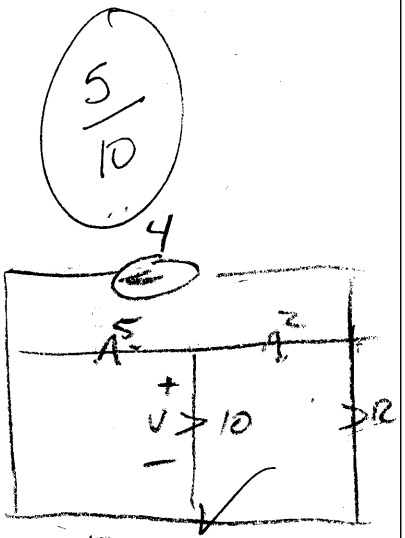


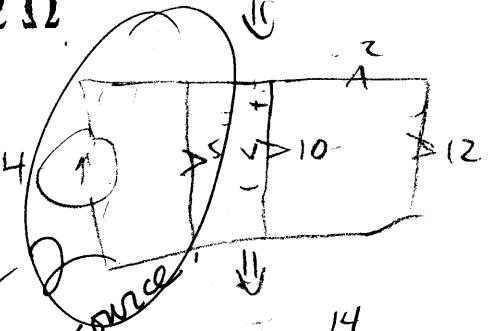


@ A

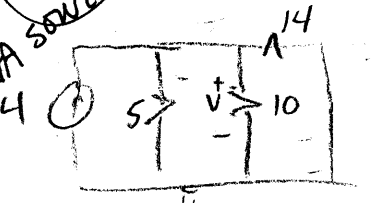
$V_A \sim 0 \Rightarrow V_x = V_S \frac{10}{15} = V_S \cdot \frac{2}{3} = \frac{220}{3}$

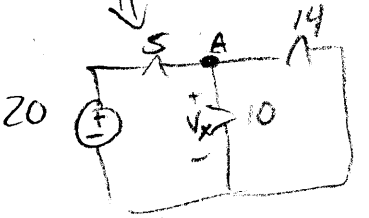
−3





NOT in parallel with 4A source





$V_A = V_x = \frac{4}{\cancel{15}\ 3} \cdot 10 = \frac{40}{3}$

Name : Tom Bachey Section: WA CWRU e-mail: txb66

2. (10 points)

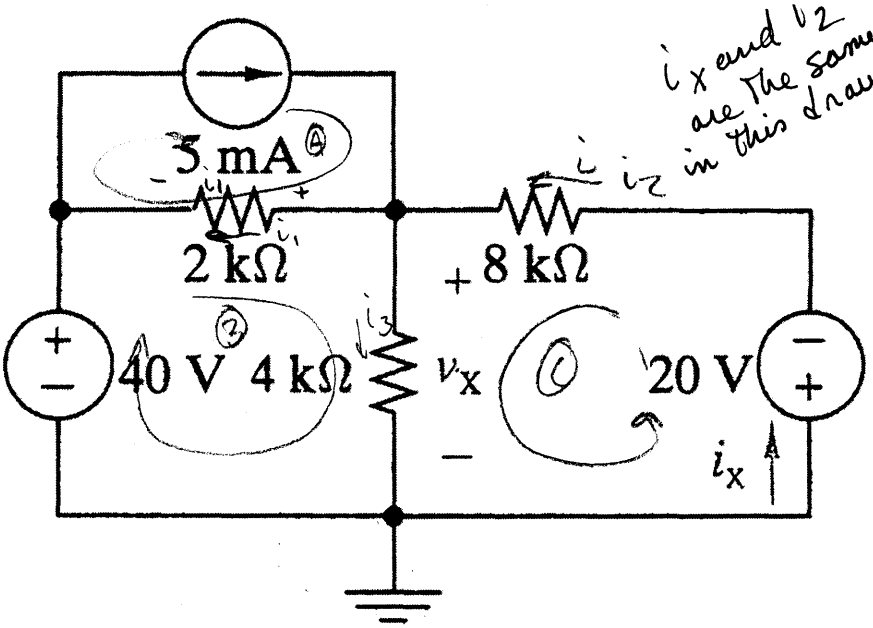
(a) How many meshes are there in the circuit given below. 2 X

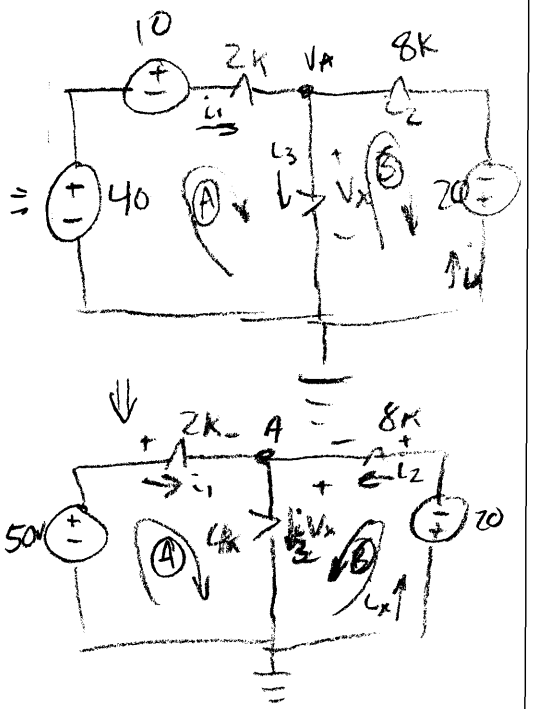
(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form. You did node voltage, not mesh current.

(c) Solve your equations for v_x and i_x.

v_x = 100/3 V

i_x = 15 mA





Name : Daniel Donato Section: ME CWRU e-mail: dpd11

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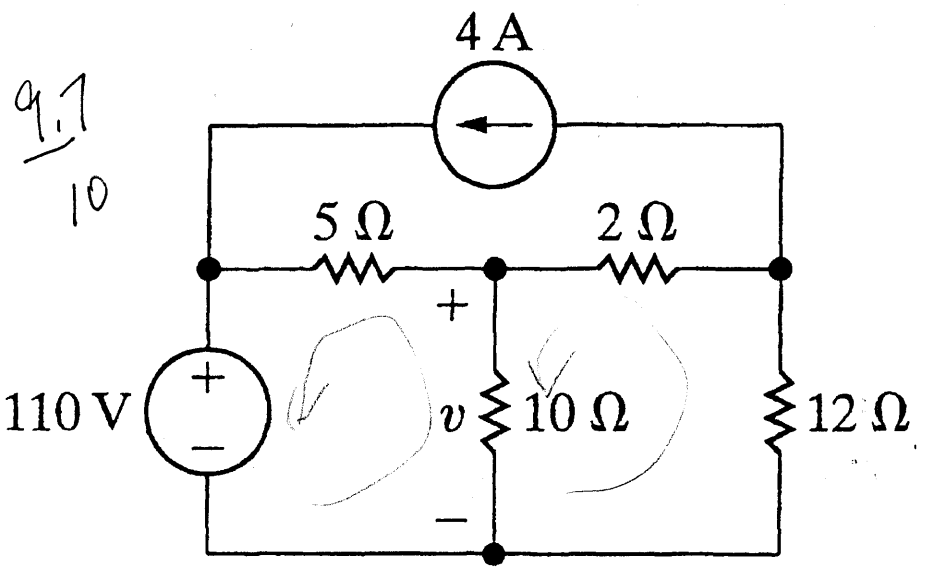
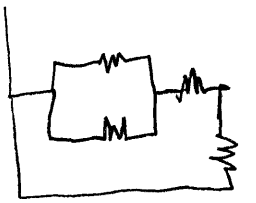
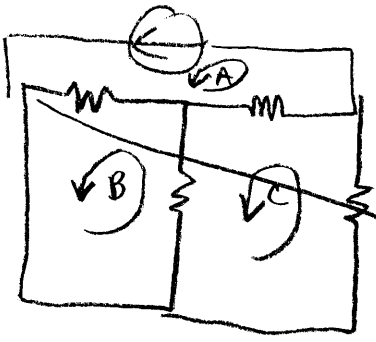
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = $\frac{40}{3}$ volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.23 volts



9.7
10



a)



$I_A = 4A$

C: $12I_C + 2I_C - 2(4) + 10I_C - 10I_B = 0$

B: $10I_B - 10I_C + 5I_B - 20 = 0$

$24I_C = 8 - 10I_B$

$I_B = \frac{10I_C + 20}{15}$

$24I_C = 8 - \frac{10(10I_C + 20)}{15}$ $\frac{100I_C}{15} + \frac{200}{15}$

$\frac{460}{15} I_C = 8 + \frac{200}{15}$ $I_C = \frac{16}{23}$ A

$I_D = 1.7971$ A

$V = 10\left(\frac{16}{23} - 1.7971\right) =$

$= 16 - 11.01$

Name : Daniel Donato Section: ME CWRU e-mail: dpd11

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

A: $20 + 8i_a + 4(i_a - i_b) = 0$ ✓

B: $40 + 4(i_b - i_a) + 2(i_b - i_c) = 0$ ✓ equations correct.

$i_c = 5\text{mA}$ ✓

A: $20 + 12i_a - 4i_b = 0$

B: $40 + 6i_b - 4i_a - 2i_c = 0$

$i_c = 5\text{mA}$ ← sign error signs not in agreement.

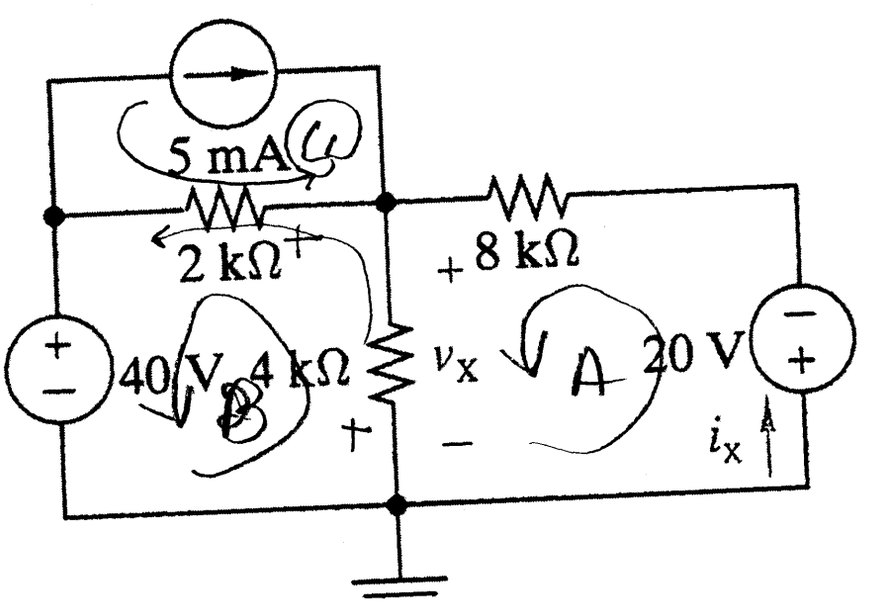
(c) Solve your equations for v_x and i_x.

$v_x =$ 54.286V

$i_x =$ 36/7 mA

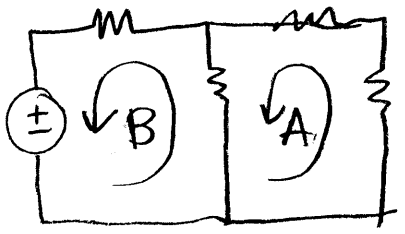
9/10.

I_X



Donato

b)



B: $10(I_A - I_B) + 5(I_B) + 110 = 0$

A: $10(I_B - I_A) + 2(I_A) + 12(I_A) = 0$

A: $10I_B + 4I_A = 0$

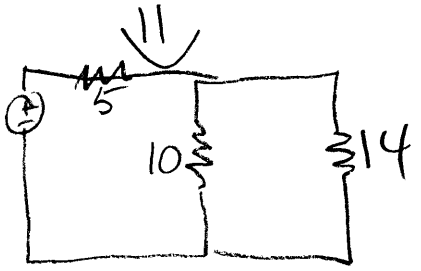
$I_A = -\frac{5}{2} I_B$

B: $10I_A - 5I_B + 110 = 0$

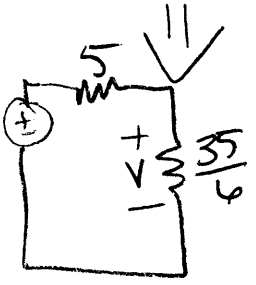
$-25I_B - 5I_B = -110$

$I_B = \frac{-110}{-30} = \frac{11}{3}\,A$

$I_A = -\frac{5}{2}\left(\frac{11}{3}\right) = -\frac{55}{6}\,A$



$\frac{1}{10} + \frac{1}{14} = \frac{24}{140}$ $\frac{140}{24} = \frac{35}{6}$

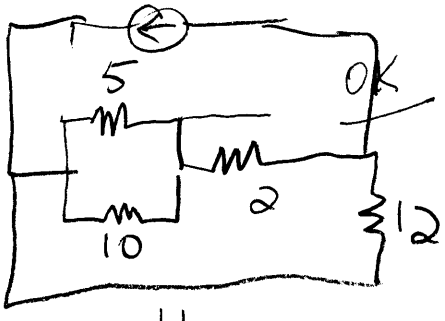


$V = (I_B - I_A)10 = \left(\frac{55}{6} - \frac{11}{3}\right)10 = 55V$

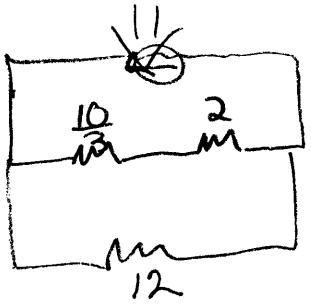
(±) $V = \dfrac{\frac{35}{6}}{5 + \frac{35}{6}}\,110 = 59.23V$

Panie!
Donato

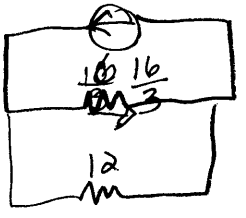
a)



$\frac{1}{5} + \frac{1}{10} = \frac{3}{10} = \frac{10}{3}$ ✓



=>



~~$1a = 4\left(\frac{12}{\frac{16}{3} + 12}\right) = \frac{36}{64} = \frac{9}{16}4 = \frac{9}{4}A$~~

Small math error near this point −0.3

$V = \frac{1}{3}(10)(4) = \frac{40}{3}\,V$

$20 + 12i_a - 4i_b$

$i_b = 5 + 3i_a$

$40 + 6(5 + 3i_a) - 4i_a - 10 = 0$

$40 + 30 + 18i_a - 4i_a - 10 = 0$

$60 = -14i_T \quad i_a = \frac{30}{7}mA = i_x$

$i_b = 5 + \frac{90}{7} = \frac{125}{7}mA$

$V_x = 4(i_b - i_a)$

$V_x = \frac{4(95)}{7} = 54.286\ V$

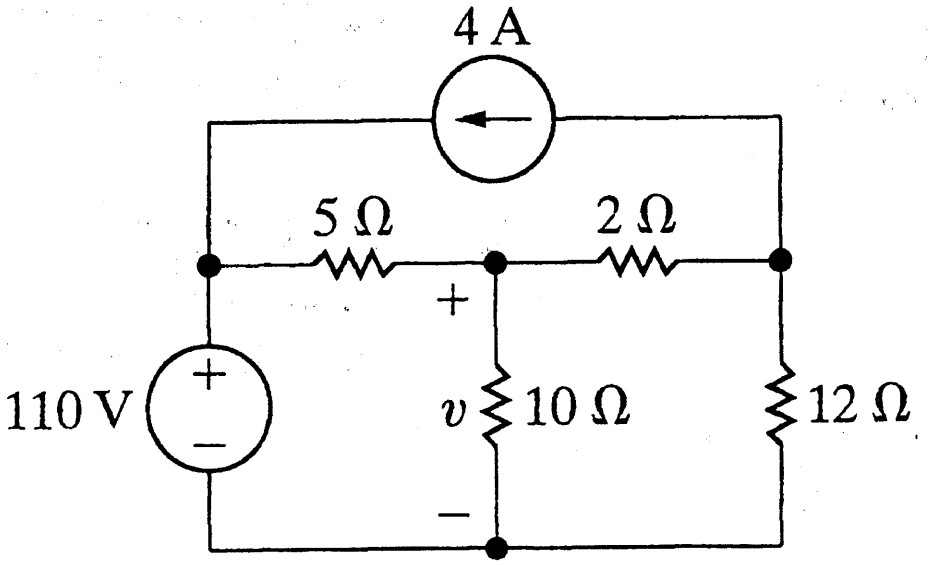
Name : Stephanie Davis Section: WE CWRU e-mail: sld9

CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

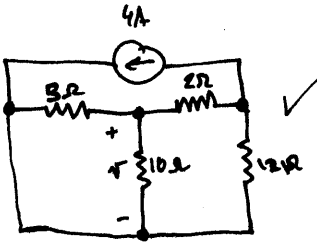
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 33.3 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 73.3V volts



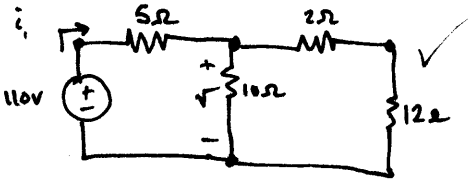
5/10.



-2

$V_{4A} = i_{EQ} \cdot 10\Omega$, $i_{EQ} = \left(\frac{10}{10+2}\right) 4A \rightarrow i_{EQ} = 3.33A$

$V_{4A} = 3.33A \cdot 10\Omega$
$= 33.3V$



$i = \frac{V_{EQ}}{R_{EQ}}$, $R_{EQ} = 5 + \left(\frac{1}{\frac{1}{10\Omega} + \frac{1}{14\Omega}}\right) = 10.83\Omega$

$i = 10.15A$

$v_{110V} = \left(\frac{10\Omega}{10+5\Omega}\right) 110V = 73.3V$

-3

Name : Stephanie Davis Section: WE CWRU e-mail: sld9

2. (10 points)

(a) How many meshes are there in the circuit given below. 2 X

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

~~$-4i_x + 4 + 40 = 0$~~

A: $-20V + 8i_x + 4i_x = 0$

~~$-40V + 10k \cdot 5mA + 4k \cdot 5mA = 0$~~

~~$-40V + 10V + V_x = 0$~~

if you use i_x as your reference signs are wrong

NO

iB

B: $-4i_1 - 2i_2 - 10V + 40V = 0$

~~$V_x = 30V$~~

~~$V_x = 4i_x = 30V \rightarrow 7.5mA = i_x$~~

$+4i_1 + 2i_2 = 30V$

$+12i_x = 20V$

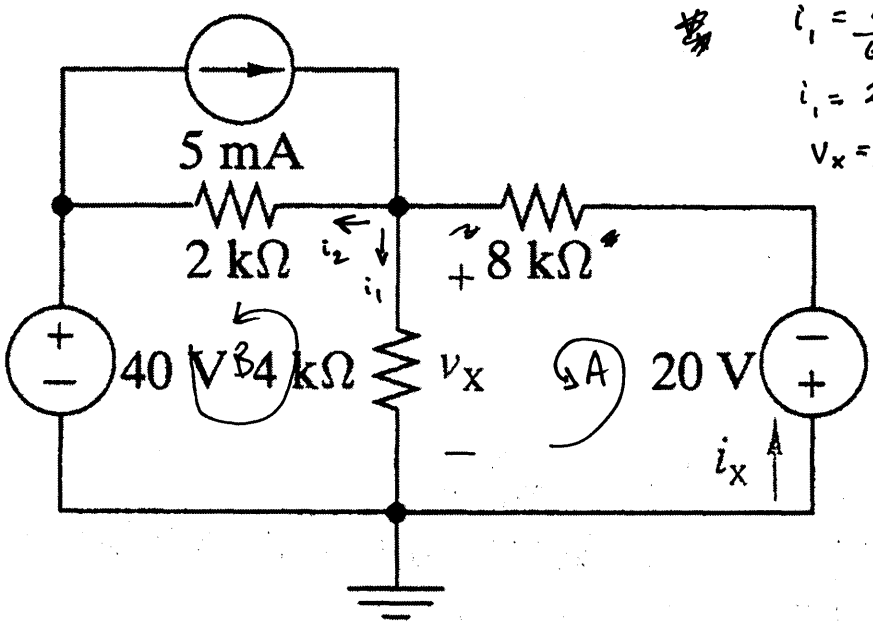
$\Rightarrow i_x = +1.67mA$

(c) Solve your equations for v_x and i_x.

v_x = ~~30V~~ 10.16V

i_x = ~~7.5mA~~ +1.67mA

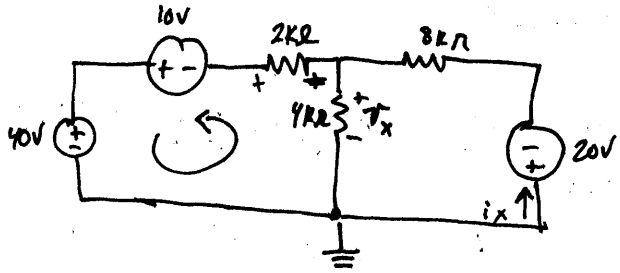
0/10



$i_1 = \frac{4i_x}{6} + \left(\frac{4}{14}\right) 5mA$

$i_1 = 2.54mA$

$V_x = 4i_1 = 4 \cdot 2.54mA = 10.16V$



Name : Carl Hacker Section: WE CWRU e-mail: CXH110

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ENGR 210. Introduction to Circuits and Instruments (4)

MAKE-UP QUIZ 1 **3/1/05**

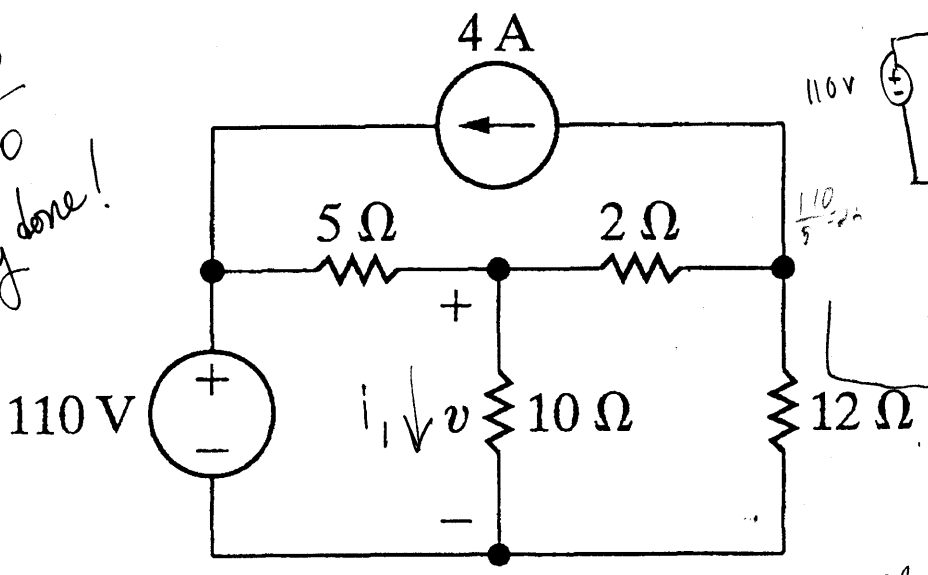
PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

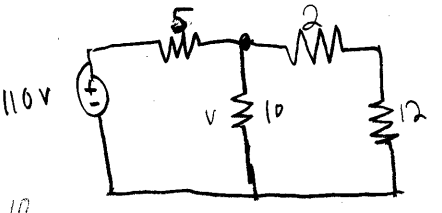
$V = V_{110V} + V_{4A} = \frac{770}{13} - \frac{120}{13} = \frac{650}{13} = 50$

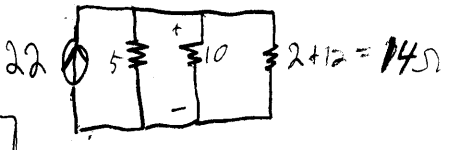
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = $-120/13$ volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = $770/13$ volts

$V = 50V$

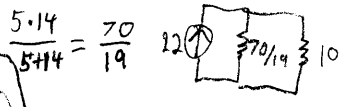
10/10 nicely done!







$\frac{5 \cdot 14}{5+14} = \frac{70}{19}$



$i_1 = i_C - i_B = \frac{16-28}{13} A = -\frac{12}{13} A$

$R_{eq} = \frac{\frac{70}{19} \cdot 10}{\frac{70}{19} + 10} = \frac{\frac{700}{19}}{\frac{260}{19}}$

$i_A = 4A$

B $15 i_B - 5 i_A - 10 i_C = 0$

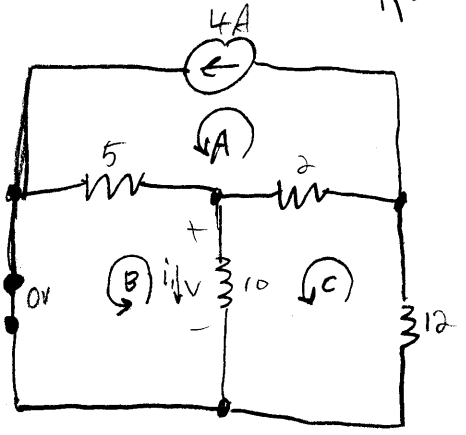
C $24 i_C - 2 i_A - 10 i_B = 0$

$2 i_A = 24 i_C - 10 i_B$

$5 i_A = 15 i_B - 10 i_C$

$i_A = 3 i_B - 2 i_C = 4A$

$i_A = 12 i_C - 5 i_B = 4A$



$V = i_1 \cdot 10\Omega = \frac{-12}{13} \cdot 10\Omega = \frac{-120}{13}$

$R_{eq} = \frac{35}{13}$

$V = i \cdot R_{eq} = \frac{35}{13} \cdot 22 = \frac{770}{13}$

$2 i_C = 3 i_B - 4A$

$i_C = \frac{3}{2} i_B - 2A$

$12 \cdot \left(\frac{3}{2} i_B - 2A\right) - 5 i_B = 4A$

$18 i_B - 24A - 5 i_B = 4A$

$13 i_B = 28A$

$i_B = \frac{28}{13} A$

$i_C = \frac{3}{2} \cdot \frac{28}{13} A - 2A$

$i_C = \left(\frac{42}{13} - 2\right) A = \frac{16}{13} A$

Name : _____ Section:_____ CWRU e-mail:_____

$K = k\Omega$

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 meshes: A, B, C — 3 supermeshes) AB, BC, ABC — 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

A $\quad i_A = 5mA$ ✓

B $\quad -2k i_A + 6k i_B - 4k i_C = 40V$ ✓

C $\quad 0 i_A - 4k i_B + 12k i_C = 20V$ ✓

$$k\Omega \cdot \begin{bmatrix} 1\cdot\frac{1}{k\Omega} & 0 & 0 \\ -2 & 6 & -4 \\ 0 & -4 & 12 \end{bmatrix} \begin{bmatrix} i_A \\ i_B \\ i_C \end{bmatrix} = \begin{bmatrix} 5A \\ 40V \\ 20V \end{bmatrix}$$

equations OK.

$12k\, i_C = 4k\, i_B + 20V$

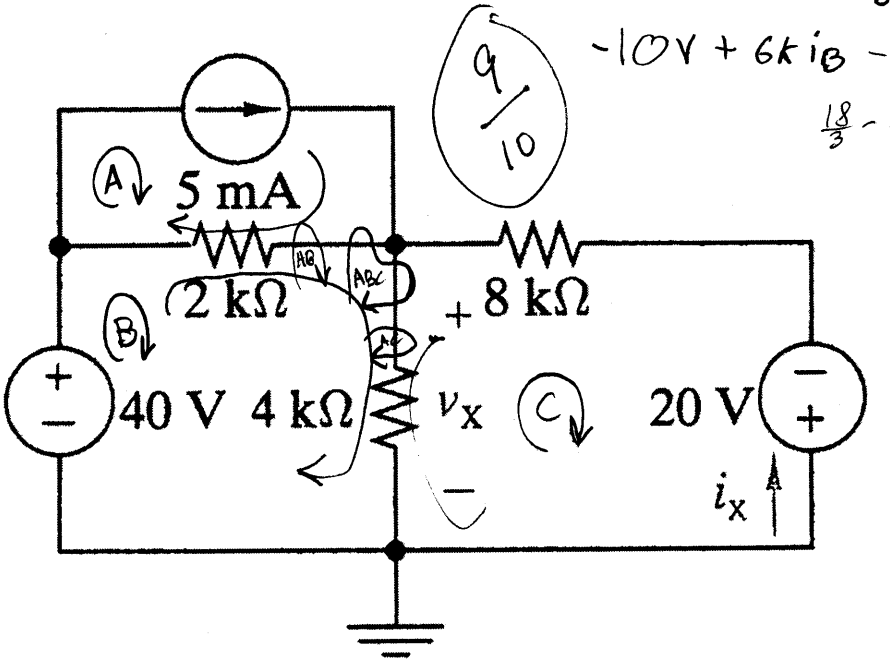
$i_C = \frac{1}{3} i_B + \frac{5}{3} mA$

math error somewhere

(c) Solve your equations for v_x and i_x.

$v_x = \frac{20}{3} V$

$i_x = -\frac{10}{3} mA$



(c): $-2k \cdot 5mA + 6k \cdot i_B - 4k\left(\frac{1}{3} i_B + \frac{5}{3} mA\right) = 20V$

$-10V + 6k\, i_B - \frac{4}{3} k\, i_B + \frac{20}{3} V = 20V$

$\frac{18}{3} - \frac{4}{3} = \frac{14}{3}$

$\frac{14}{3} k i_B = \left(20 + 10 - \frac{20}{3}\right) V$ ($\frac{90}{3} - \frac{20}{3}$)

$\frac{14}{3} k i_B = \frac{70}{3} V$

$i_B = \frac{70}{14k} V$

$i_B = 5mA$

$V_x = (i_B - i_C)\, 4k\Omega$

$\left(5mA - \frac{10}{3} mA\right) 4k\Omega$ ($\frac{15}{3} - \frac{10}{3}$)

$\frac{5}{3} mA \cdot 4k\Omega$

$V_x = \frac{20}{3} V$

$-4k \cdot 5mA + 12k\, i_C = 20V$

$-20 + 12k\, i_C = 20V$

$i_C = \frac{40}{12} mA$

$i_C = \frac{10}{3} mA$

$i_C = -i_x$

$i_x = -\frac{10}{3} mA$

Name: Liz Hahn Section: WF CWRU e-mail:

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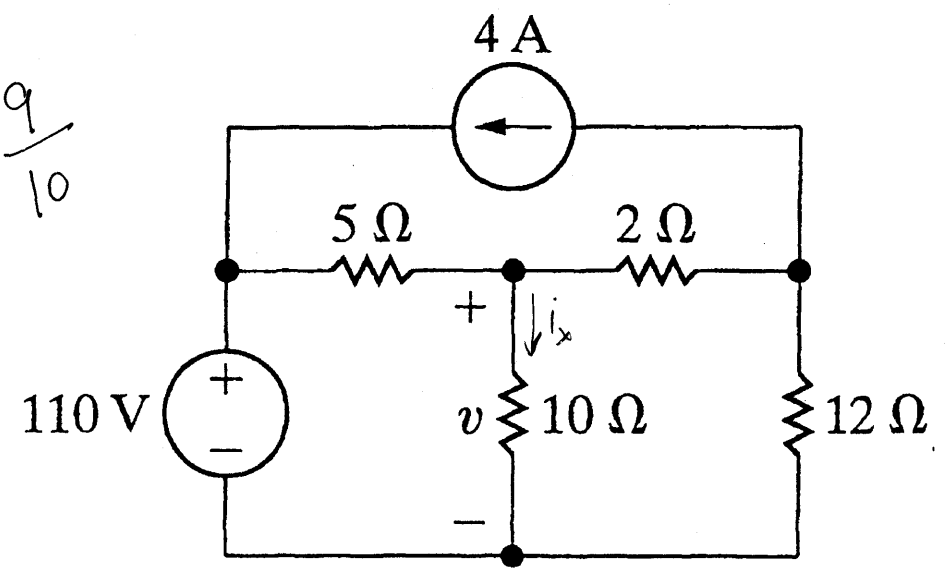
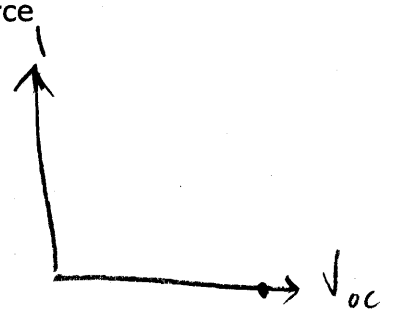
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

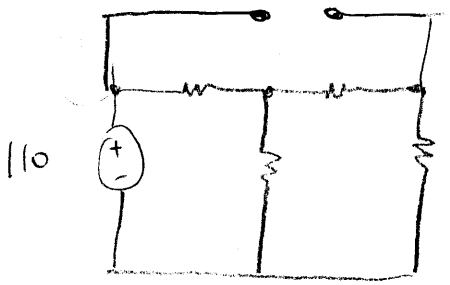
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 1.537 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.2 ✓ volts

9/10



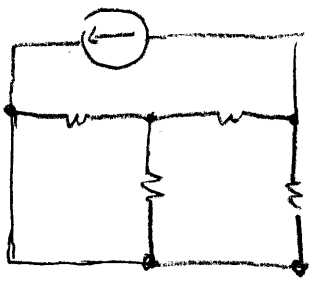


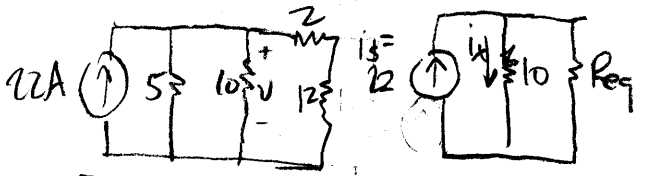
(b)



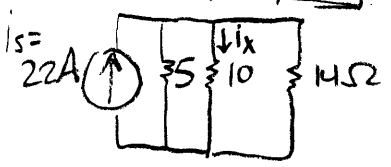
$R_{eq} = \frac{5.14}{19} = 3.68$

(a)





$i_s =$



$$i_x = \frac{22A(3.68\Omega)}{3.68 + 10} = 5.92A$$

$$V_{110V} = 10\Omega(5.92A) = 59.2\,V$$

Name : _____ Section:_____ CWRU e-mail:_____

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

(A) $5mA = i_A$ ✓

(B) $-40V + 2k\Omega(i_B - i_A) + 4k\Omega(i_B - i_C) = 0$ ✓

(C) $4k\Omega(i_C - i_B) + 8k\Omega i_C - 20V = 0$ ✓

10/10

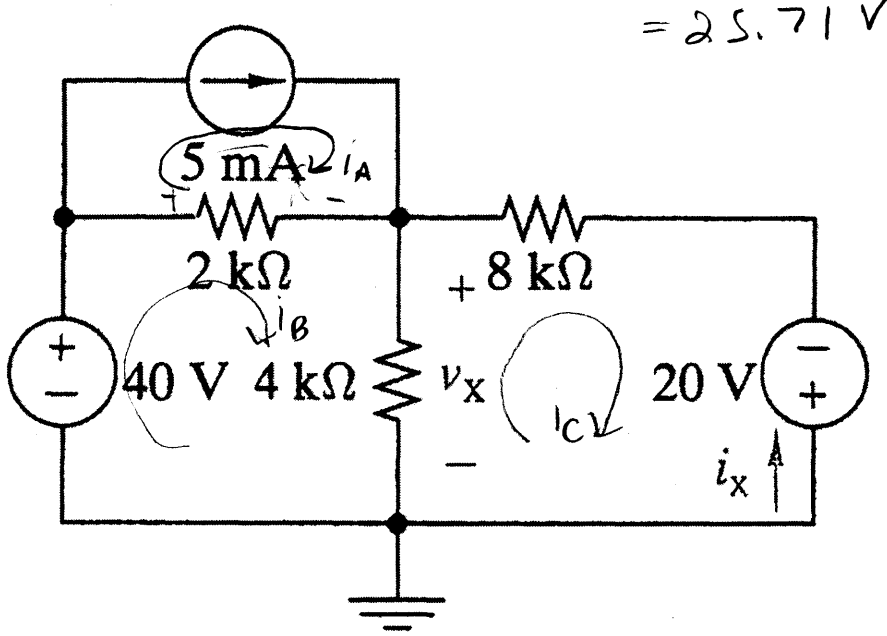
(c) Solve your equations for v_x and i_x.

v_x = 25.71 V

i_x = -5.71 mA

$v_x = 4k(i_B - i_C)$

$= 25.71\ V$



$.005 = i_A$

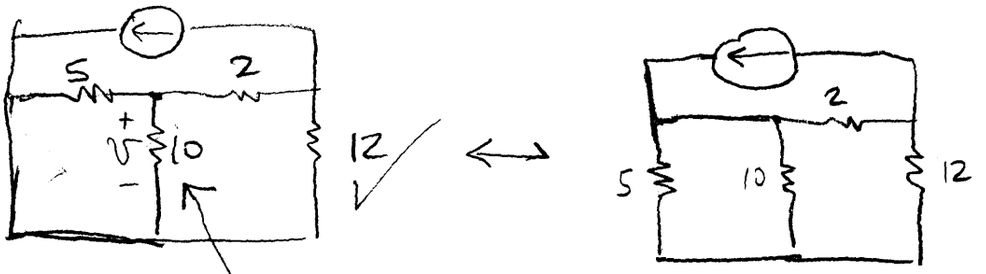
$6000 i_B - 2000 i_A - 4000 i_C = 40\ V$

$12000 i_C - 4000 i_B = 20\ V$

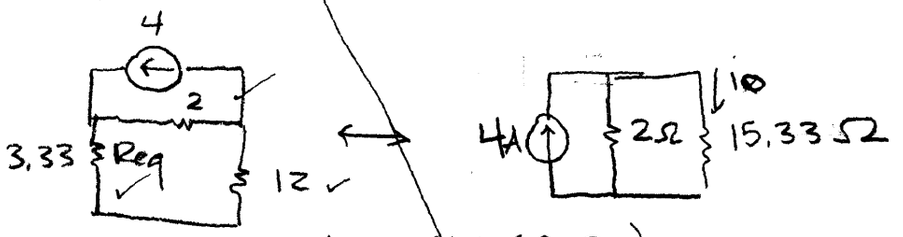
$$\begin{bmatrix} 6000 & -4000 \\ -4000 & 12000 \end{bmatrix} = \begin{bmatrix} 50\ V \\ 20 \end{bmatrix} \begin{bmatrix} i_B \\ i_C \end{bmatrix} \quad \begin{matrix} 0.0121 = 12.1\ mA \\ 0.0057 = 5.71\ mA \end{matrix}$$

Liz Hahn

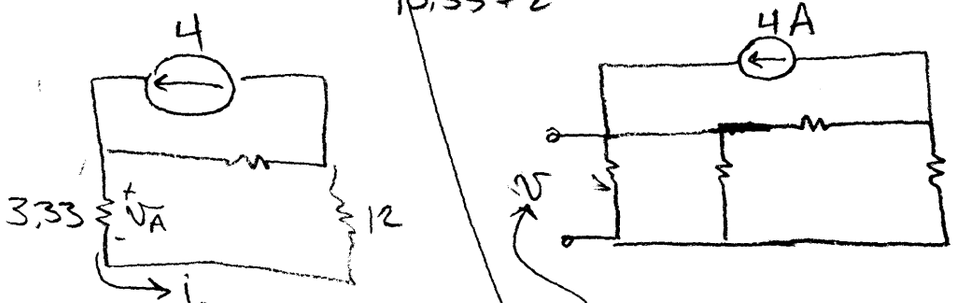
(a)



$$Req_1 = \frac{5 \cdot 10}{15} = 3.33\,\Omega$$



$$i_o = \frac{4A\,(2\Omega)}{15.33 + 2} = 0.4615\ A$$



$$V_A = (0.4615A)(3.33\Omega) = 1.537\,V = v_{4V}$$

this is Not the current labeled i_o above

Name : Trevor Ilse Section: ME CWRU e-mail: Tji1

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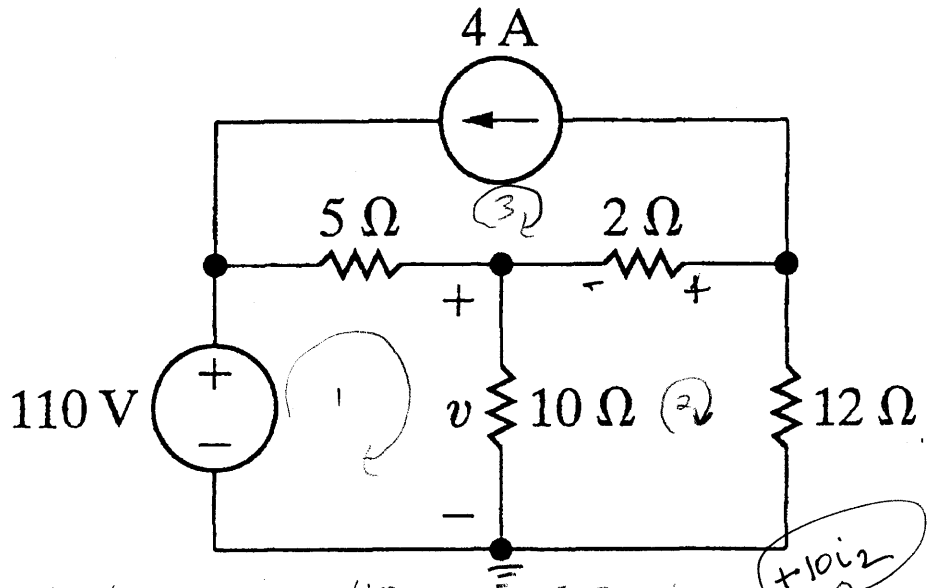
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 6 2/3 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 23 1/3 volts

8.5/10.



[B] KVL → Loop rule $110V - i_1 5\Omega - i_1 10\Omega + 10 i_2 = 0$

Assume current source is unknown

$110V = i_1(5+10\Omega$

$7\frac{1}{3} = i_1$

Voltage $= iR = (7\frac{1}{3} A)(10\Omega) = 73\frac{1}{3} V$

[A] Use mesh currents This is a very difficult way to solve problem.

mesh 1: $-5\Omega i_3 - (10\Omega i_2 + (15\Omega) i_1 = 0$ OK

mesh 2: $24\Omega i_2 - 10\Omega i_1 - 2\Omega i_3 = 0$ OK.

mesh 3: $i_3 = -4A$ OK.

$(-5\Omega)(-4A) - 10\Omega i_2 + 15\Omega i_1 = 0$

$20V + 15\Omega i_1 = 10\Omega i_2$

$\frac{20V + 15\Omega i_1}{10\Omega} = i_2$

Plug into matrix

Find

$2.4(24\Omega)\left(\frac{20V + 15\Omega i_1}{10\Omega}\right) - 10\Omega i_1 - 2\Omega(-4A) = 0$

$48V + 36\Omega i_1 - 10\Omega i_1 + 8V = 0$

$56V + 26\Omega i_1 = 0$

$i_1 = \frac{-56V}{26\Omega} = -2.154A$

seems correct to here.

$i_1 - i_2 = i_{total}$ math: $(6\frac{2}{3}A)(10\Omega) = 66.7V$

This does not agree with your other answers

Name : Trevor Ilse Section: ME CWRU e-mail: Tji1

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

I hope part A isn't a trick question. I realize that the current in mesh 1 is 5mA. Yes

$i_1 = 5mA$ ✓

$i_2(6k\Omega) - (2k\Omega)(i_1) - 4(k\Omega)i_3 = +40V$

$i_3(12k\Omega) - (4k\Omega)i_2 = +20V$ ← sign

9/10

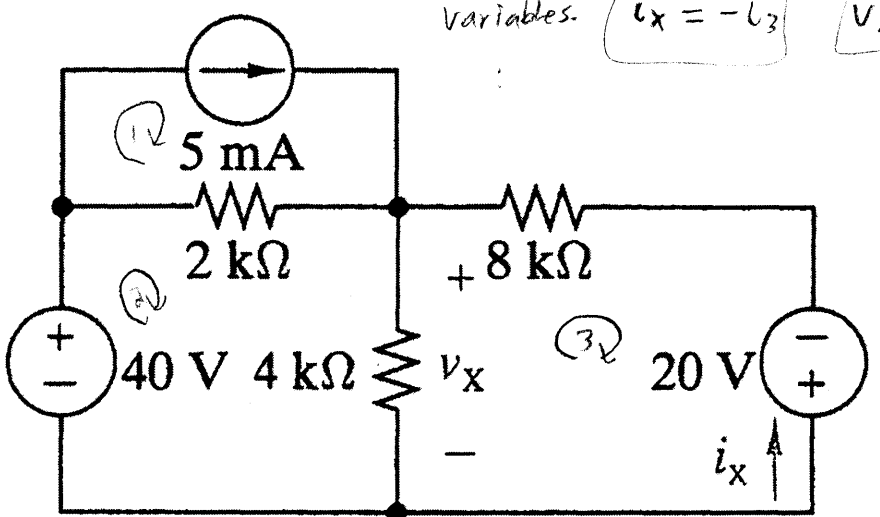
(c) Solve your equations for v_x and i_x.

v_x = 108.6 V

i_x = −19.28 mA

$i_x = -i_3$

Either use a matrix, or solve for variables. $i_x = -i_3$ $v_x = (i_2 - i_3)(4k\Omega)$



$i_2(6k\Omega) - (2k\Omega)(5mA) - 4k\Omega\, i_3 = -40V$

$i_2 6k\Omega - 10V + 40V = (4k\Omega)i_3$

$\frac{(6000\Omega)i_2 + 30V}{4000\Omega} = i_3$

$i_3(12k\Omega) - (4k\Omega)i_2 = -20V$

$3(12000\Omega)\left(\frac{6000\Omega\, i_2 + 30V}{4000\Omega}\right) - i_2(4000\Omega) + 20V = 0$

$i_2 18k\Omega + 90V - i_2 4k\Omega + 20V = 0$

$i_2(14k\Omega) + 110V = 0$

$i_2 = -7.86mA$

$\frac{(6000)(-.007857A) + 30V}{4000\Omega} = i_3 = \frac{77.14V}{4000\Omega} =$

$i_3 = 19.28mA$

$i_x = -i_3$

$V_x = ((-7.86mA) - (19.28mA))(4000\Omega) = 108.57$

Name : Mark Krajcarek Section: WA CWRU e-mail: Mgk5

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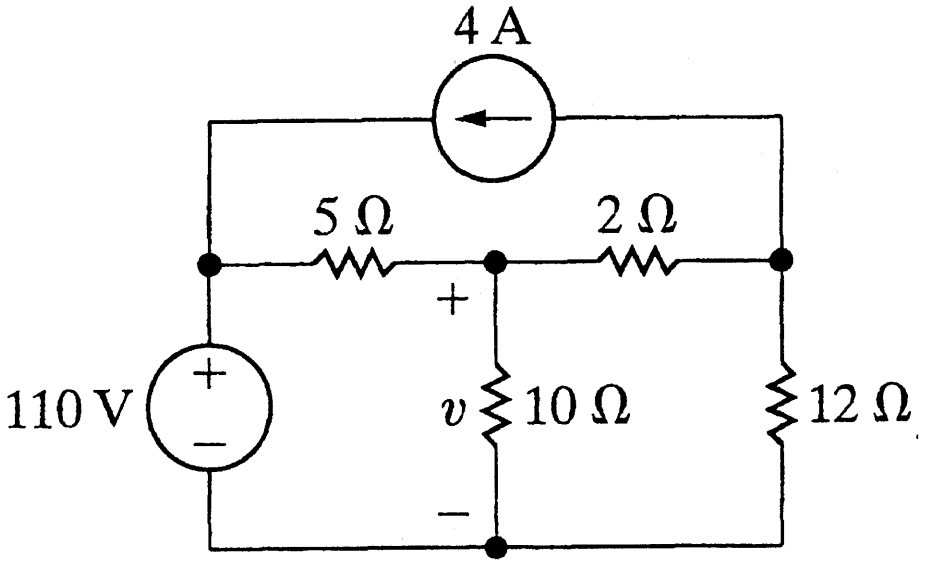
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

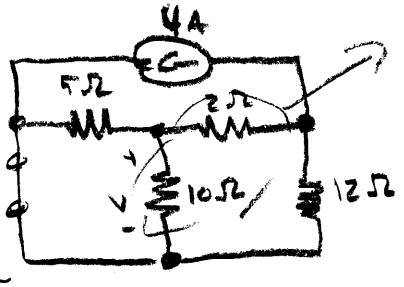
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 4.67 V volts

   b. find the contribution to v from the 110V voltage source
      v_{110V} = 58.92 V volts



6/10

a.) turn off Voltage Source



short, NOT open

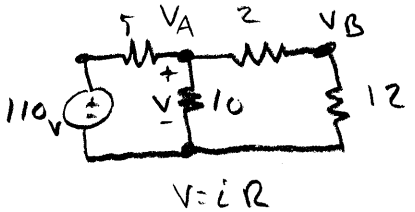
$R_{eq} = \frac{(2)(10)}{12} = \frac{20}{12}$

$R_{eq} = \frac{20}{12} + 5\Omega + 12\Omega = 18.67\Omega$

$V = iR \qquad \frac{18.67}{4} = 4.67\ V$

-2

b.) Turn off current source



$V = iR$

~~$R_{eq} = \frac{(2)(10)}{12} = \frac{20}{12}$~~

I have no idea what you are doing here. 2 and 10 are not in parallel.

$R_{eq} = 18.67\Omega$

-2.

$V = iR \qquad i = \frac{110}{18.67} = 5.9\ A$

$V = (5.9A)(10\Omega) = 58.92\ V$

Name : Mark Krajcarek Section: WA CWRU e-mail: mgk5

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 Meshes ✓ 1 Super Mesh

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

① $(5mA)\left(\frac{2\cdot 4}{6}\right) - (20mA)(2k\Omega)$ what is this?

② $\frac{40V}{2k\Omega} - \frac{10V}{2k\Omega} + \frac{4V_x}{4k\Omega} + \frac{i_x(8k\Omega)}{4k\Omega} = 0$

$\frac{V_x}{4k\Omega} + \frac{i_x(8k\Omega)}{4k\Omega} = 15mA \Rightarrow \frac{V_x + i_x(8k\Omega)}{4k\Omega} = 15mA$

③ $\frac{-20V}{8k\Omega} + \frac{V_x}{4k\Omega} - \frac{20V}{12k\Omega} = 0 \Rightarrow \frac{V_x}{4k\Omega} = \frac{20V}{8k\Omega} + \frac{20V}{12k\Omega}$

9/10

(c) Solve your equations for v_x and i_x.

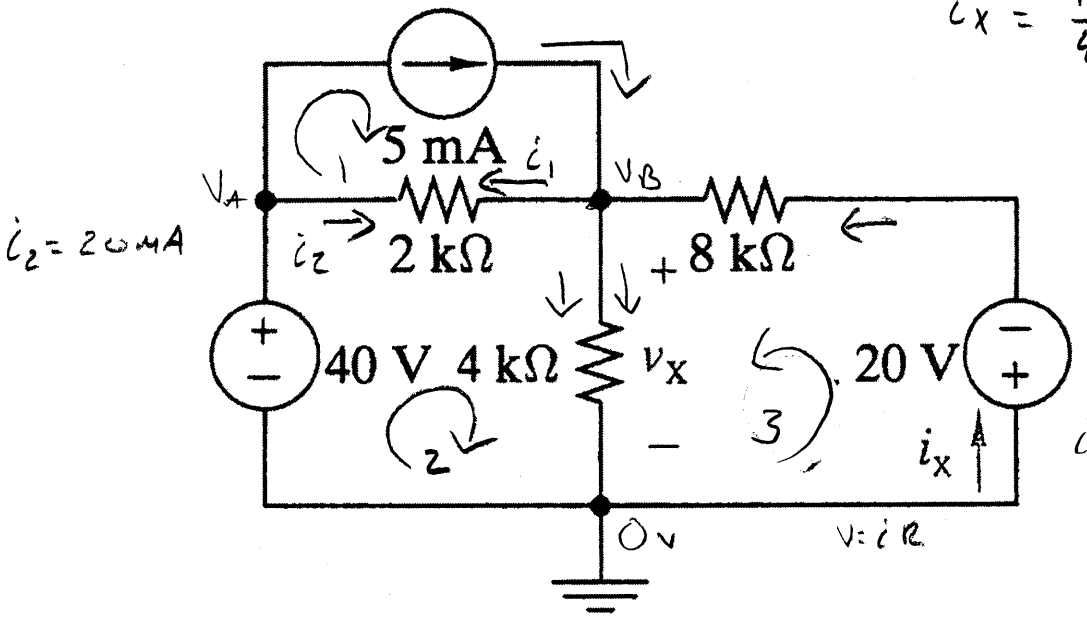
v_x = 16.67 V

i_x = 4.67 mA

$V_x = i_x R$

$V_x = 16.67\ V$

$i_x = \frac{16.67}{4k\Omega}$



$i_x = \frac{20V}{4k+8k} = \frac{20V}{12k\Omega}$

Name : Charles Kanek Section: 4 CWRU e-mail: CPK4

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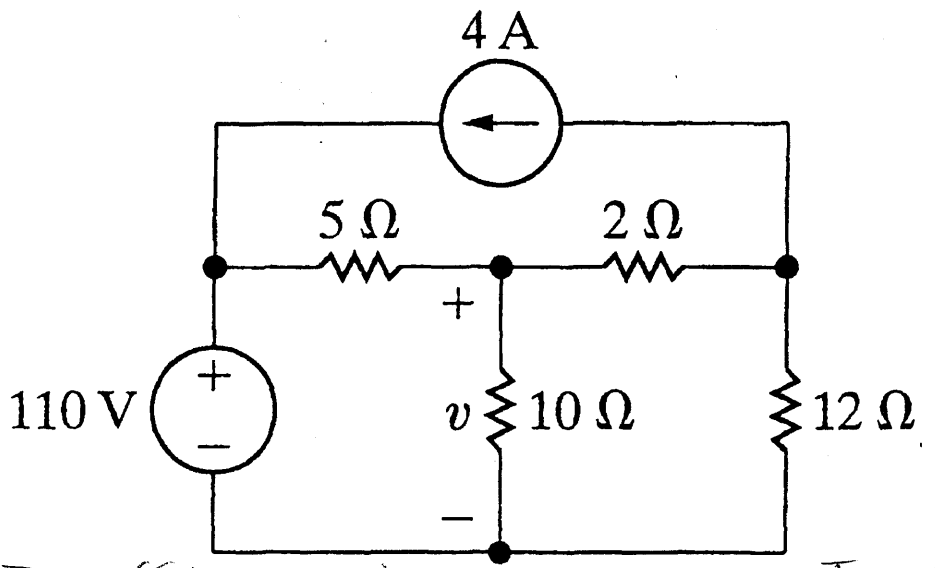
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

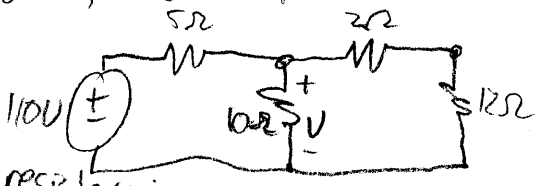
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 24.51 volts

   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.22 V volts

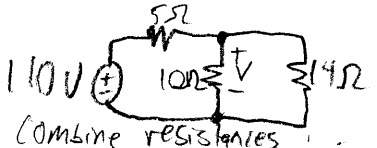


7/10

Turn off the current source:



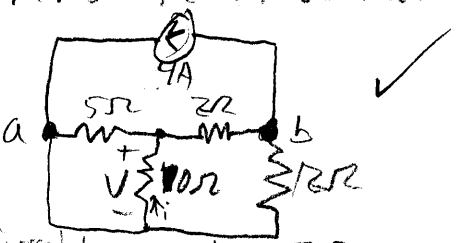
Combine resistances:



Combine resistances:

Voltage across the 5.833 Ω resistor is 59.22 V. It's the same as the voltage across the 10 Ω resistor

Turn off the voltage source:



Current has a path of 7Ω, a path of 12Ω, and a path of 12Ω from a to b. Use this as a current divider. The current i is $4A \times \left(\frac{12\Omega}{31\Omega}\right) = 2.457A$.

Use V=IR to find $V_{UA} = 24.51$ V

3

Name : Charles Kanes Section: WA CWRU e-mail: CPK4

2. (10 points)
(a) How many meshes are there in the circuit given below. 3 ✓
(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

Mesh 1: $i_1 + i_2 - 5\,mA = 0$

Mesh 2: $i_2 + i_1 - (40V/6\,k\Omega) - i_X = 0$

mesh 3: $i_X - i_2 + (20V/12\,k\Omega) = 0$

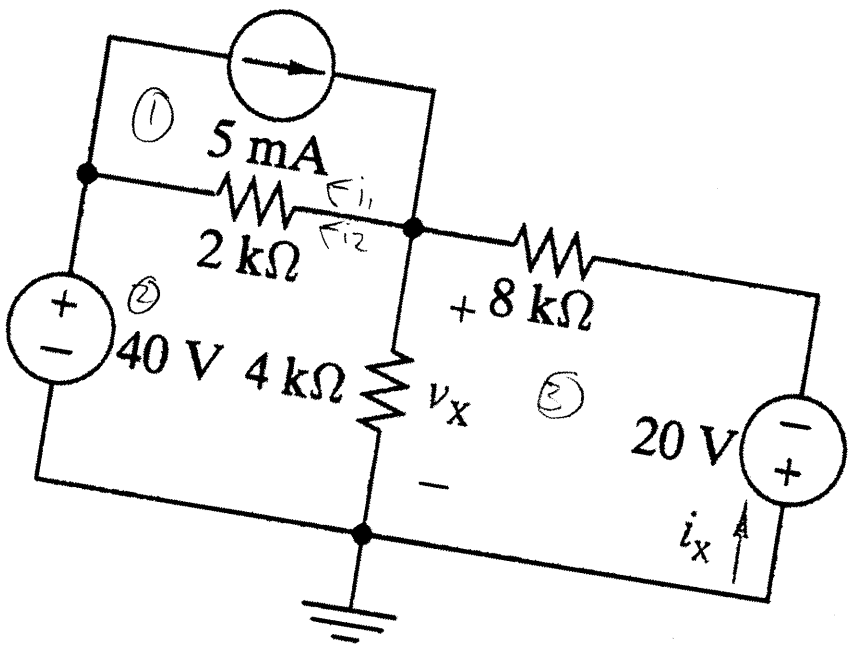
Meshes ~~~~~ equations are written in terms of currents not voltages.

(c) Solve your equations for v_x and i_x.

$v_x =$ 31.415 V

$i_x =$ −1.4285 A

1/10



Name : Max Rothschild Section: MA CWRU e-mail: mgr46

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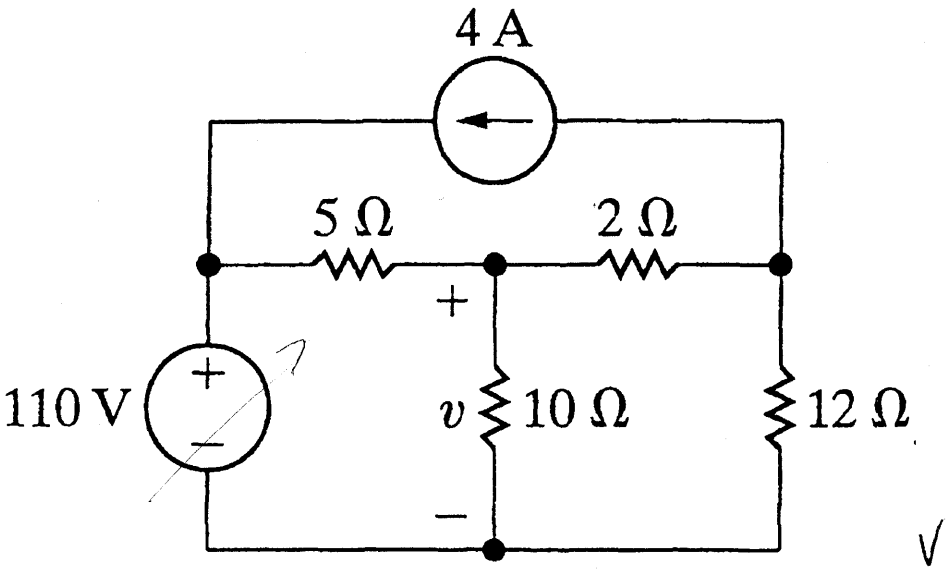
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

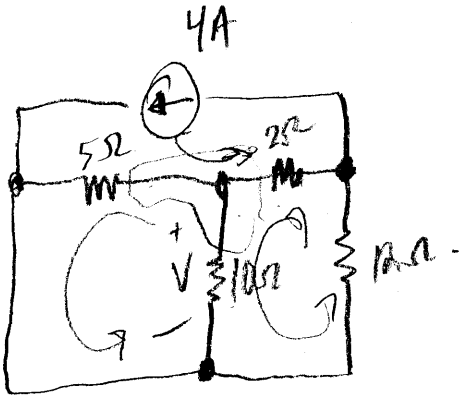
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 0.45 V volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 72.6 V volts

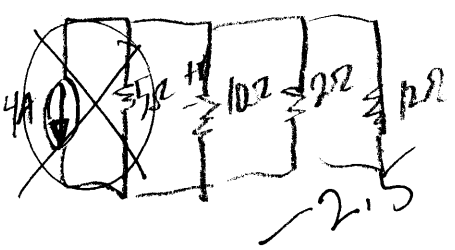
5.5/10



V = IR

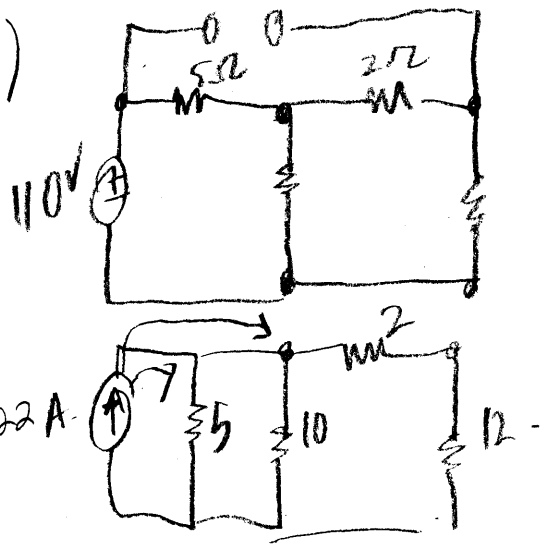
a)





2.5

b)



Name : Max Kotlarchyk Section: MA CWRU e-mail: mak46

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

MESH (A): $+2k i_A - 8k i_B = 0$ X You ignored the 5mA source in loop

MESH (B): $+40\,V + 4k i_B - 4k i_X + 2(i_X - i_A) = 0$ (i_B NOT i_X)

$-2k i_A + 4k i_B - 2k i_X = -40$

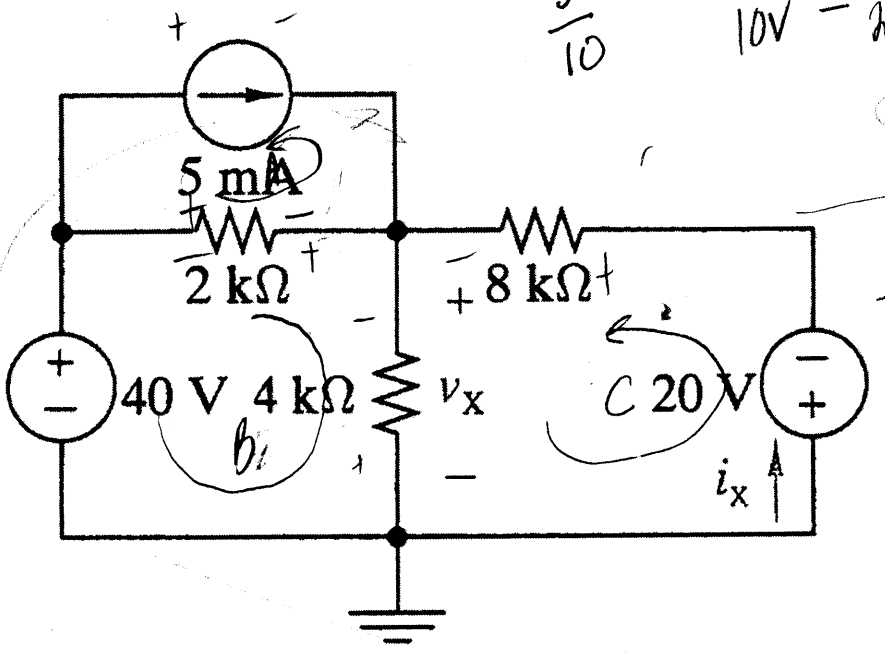
MESH C: $+20V + 8k i_X + V_X - 4k i_B = 0$ ✓

$8k i_X + V_X - 4k i_B = -20V$

(c) Solve your equations for v_x and i_x.

v_x = 200V

i_x = 25 mA



$(2k)(5mA) = 10\,V$

$\frac{5}{10}$

$10V - 2k i_B = 0$ $\quad i_A = i_B$

$i_B = 5\,mA$

$-10 + 40 - 2k i_X = -40$

$-2k i_X = -50$

$i_X = 25\,mA$

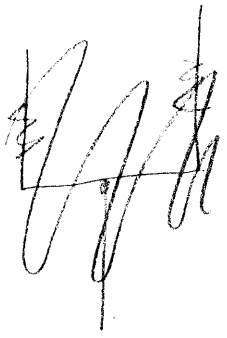
$8k \cdot (25\,mA) + V_X - 20 = -20$

$V_X = 200\,V$

1a)

Max
Kirchhoff

Current divider

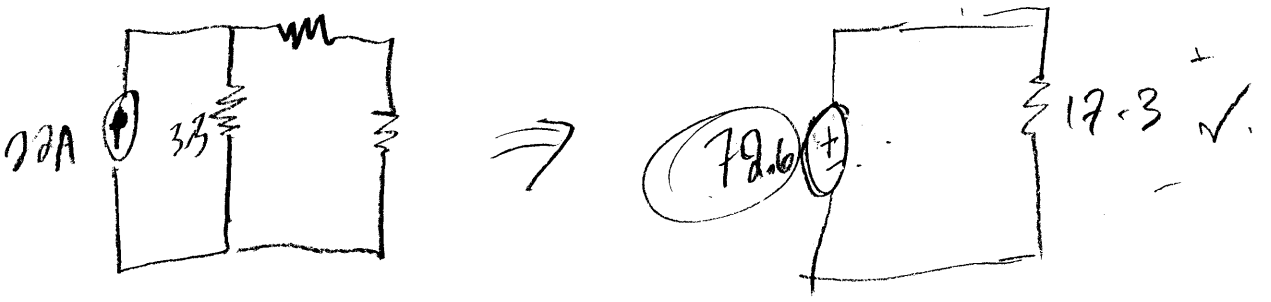


$$i_5 = \left(\frac{\frac{1}{10}}{\frac{1}{5} + \frac{1}{10} + \frac{1}{2} + \frac{1}{12}} (4A) \right) =$$

$$V = IR = (10\,\Omega)(0.113\,A) = 0.45V$$

Max K.

1b) cont $\frac{50}{15} = 3.3$



✓

V =
Not sure what you transformed here,

−2

Name : David Lenzer Section: WA CWRU e-mail: DCL8

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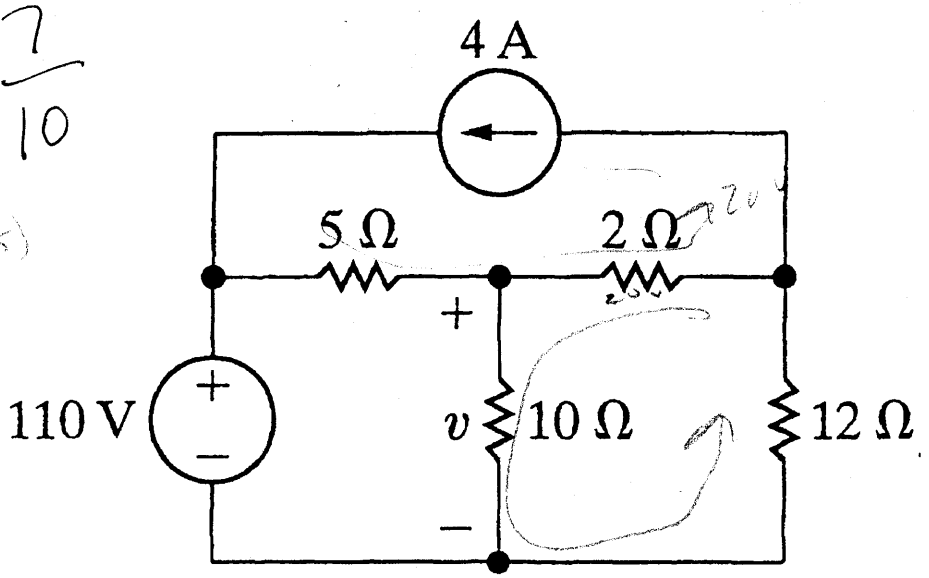
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 9.09 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.22 ✓ volts

7/10



$V = IR$

$V = iR$

$V = iR$

$-20 + i(R+R) = 0$

$-20 + V - iR = 0$

$+20 = i(10+12)$

$20 = i(22)$

$i = 0.90909$

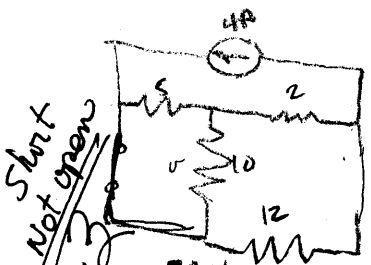
$V = iR$

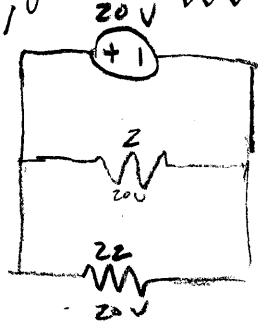
$R = 10$

$V = 0.90909(10)$

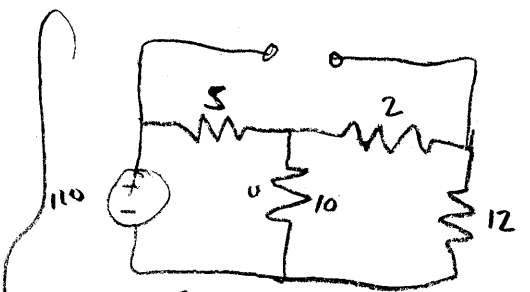
4A

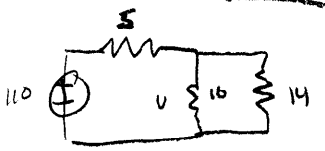
Short Not open



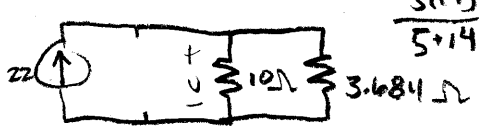


110





$\frac{5(14)}{5+14} = 3.684$



$i_5 = \frac{\frac{1}{10}}{\frac{1}{10} + \frac{1}{3.684}}(22) =$

5.922

$V = iR = 5.922(10)$

$V = 59.22$

Name : DAVID LENZEN Section: WA CWRU e-mail: DCL8

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

MESH I $-i_1 + 5\text{mA} = 0$

MESH II $i_5 + i_1 + i_2 + i_3 = 0$

MESH III $-i_2 - i_4 - i_x = 0$

$i_1 = 5\text{ mA}$

$i_x = -i_4 - i_2$

$i_4 + 0.005 + i_1 = i_2$

$i_3 = i_1 + 0.005$

$i_2 = i_3 + i_x$

No

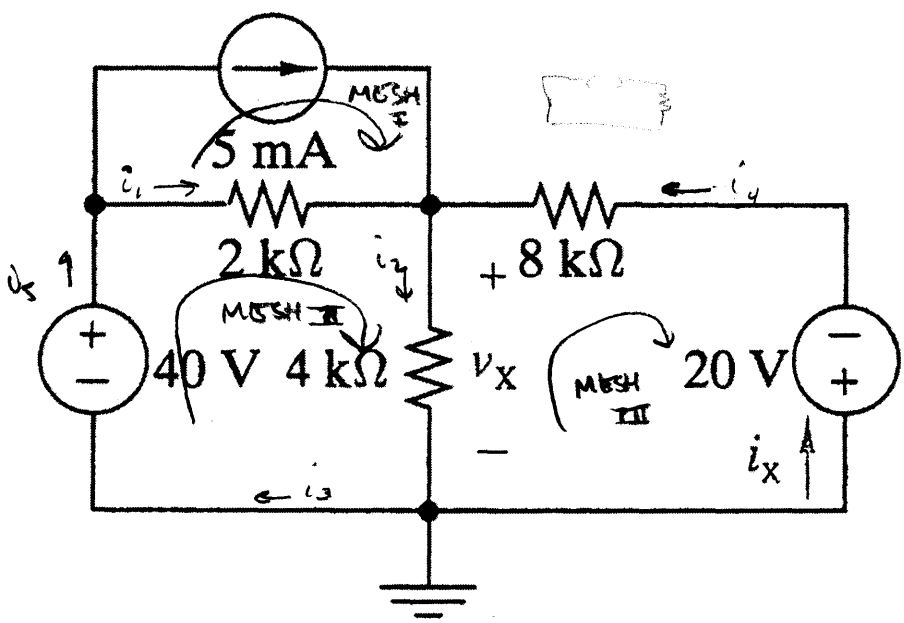
mesh current means you sum up the voltages using KVL.

1/10

(c) Solve your equations for v_x and i_x.

$v_x =$ _____ V

$i_x =$ _____ mA



V = IR

$v_x + 20 - 8000 i_4 = 0$

$-40 + 2000 i_1 + v_x = 0$

$v_x = i_2 4000$

$-40 + 2000 i_1 + 8000 i_4 - 20V = 0$

$60 = 2000 i_1 + 8000 i_4$

$40 - 2000(.03 - 4i_4) = v_x$

$.03 = i_1 + 4i_4$

Name : Amy Orsborn Section: WA CWRU e-mail: a105

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MAKE-UP QUIZ 1 **3/1/05**

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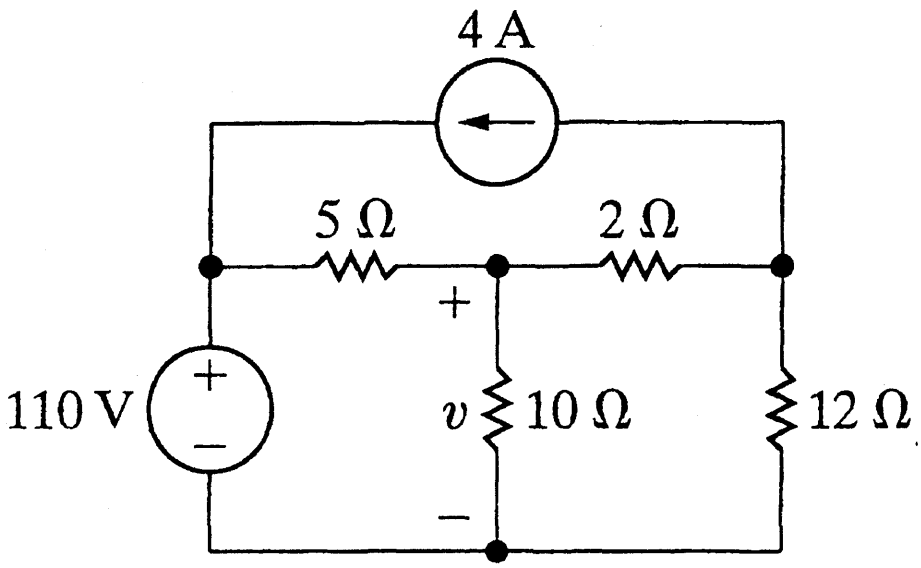
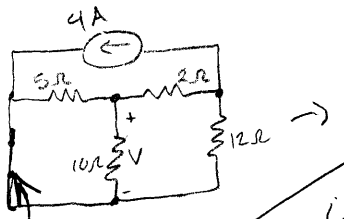
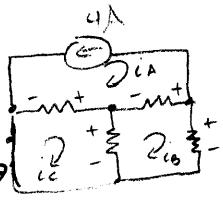
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 20 V volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 128.33 V volts



3/10

circuit 1





Short
NOT open

$i_A = -4A$ $i_C = 0$ because of break!

$-2(i_A - i_B) + 12i_B - 10i_B = 0$

$-2i_A + 4i_B = 0$

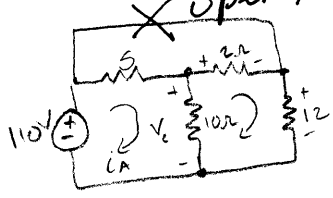
$i_B = \frac{1}{2} i_A$

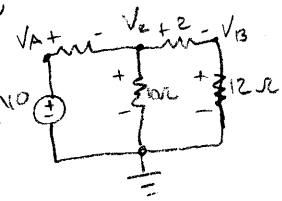
$i_B = -2A$

$\therefore V_1 = 2A \cdot 10\Omega = 20V$

circuit 2

open, not short.





i $V_A = 110V$

$\frac{V_A - V_2}{5} + \frac{V_2 - 0}{10} = \frac{V_2 - V_B}{2}$

$22 - \frac{3}{5}V_2 = -\frac{V_B}{2}$

$22 - \frac{3}{5}V_2 = -\frac{3}{7}V_2$

$22 = \frac{6}{35}V_2$

$V_2 = \frac{385}{3}V = 128.33$

$\frac{V_2 - V_B}{2} = \frac{V_B - 0}{12}$

$\frac{7}{12}V_B = \frac{V_2}{2}$

$V_B = \frac{6}{7}V_2$

Name : Amy Orsborn Section:_____ CWRU e-mail:_____

2. (10 points)

(a) How many meshes are there in the circuit given below. 3

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

$i_A = 5mA$ ✓ $\quad i_x = -i_c$

$8i_c - 20V - 4(i_B - i_c) = 0$ ✓ $\quad 4(i_B - i_c) - 40V - 2(i_A - i_B) = 0$ ✓ OK

9.7/10

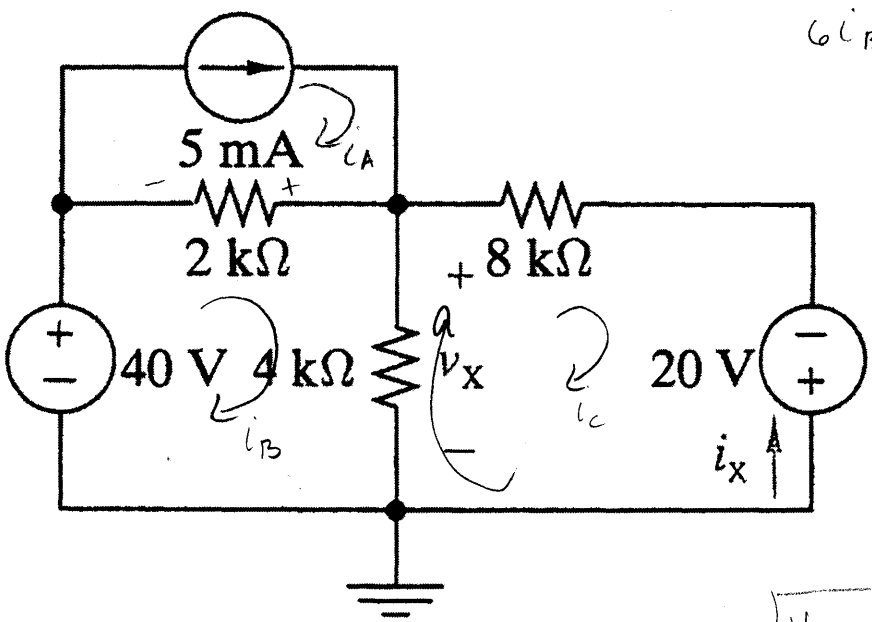
(c) Solve your equations for v_x and i_x.

$v_x =$ 25.712 V

$i_x =$ -5.714 mA

$12i_c - 4i_B = 20$

$i_B = 3i_c - 5mA$



$6i_B - 4i_c - 2k\Omega(5mA) = 40$

$6i_B - 4i_c = 50$

$6(3i_c - 5) - 4i_c = 50$

$14k\Omega\, i_c = 80\,V$

$i_c = 5.714\,mA$

$\therefore i_B = 12.142\,mA$

$V_x = (i_B - i_c)4k\Omega$

$= (12.142 - 5.714)mA \cdot 4k\Omega$

$= 25.712\,V$

Small math error somewhere.

$i_x = -i_c = -5.714\,mA$

Name : ZACH MINEAR Section: TE CWRU e-mail: ZJM2

CASE WESTERN RESERVE UNIVERSITY
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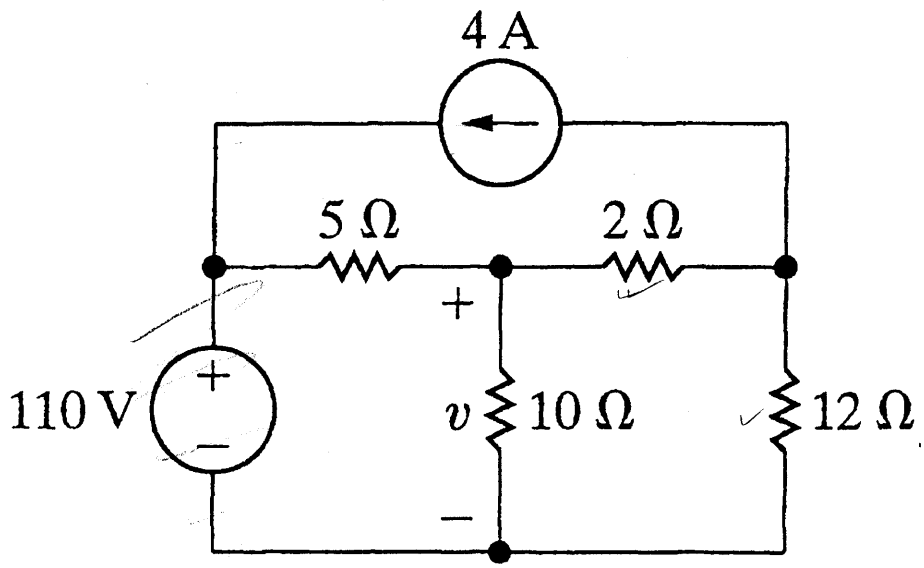
ENGR 210. Introduction to Circuits and Instruments (4)

MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

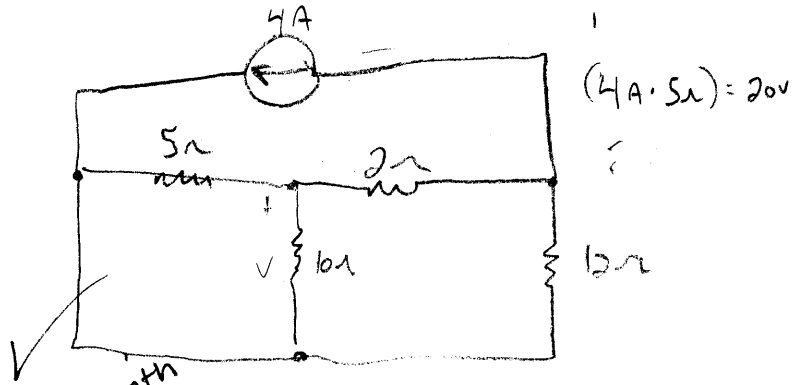
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 20V volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 73.33 volts



V=iR

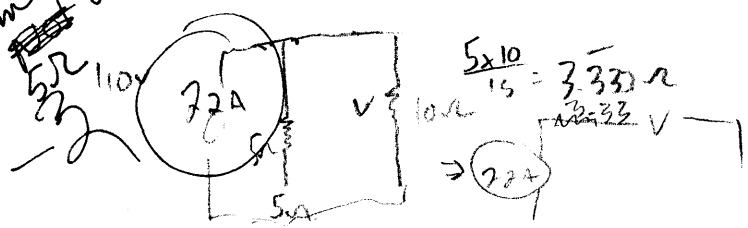
4.5/10.

For 4A



(4A · 5Ω) = 20V

can't transform with

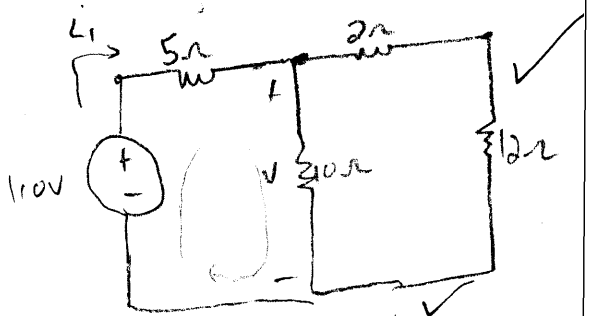


5x10/15 = 3.33Ω

3.33 V

⇒ (22+)

For 110V



110V + i1(5Ω) + V = 0

110V

i1 = 110/5 = 22A how did you get 20Ω. −2.5

⇒ 110V + 22(

Name : ZACH MINEAR Section: TE CWRU e-mail: ZJM2

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

MESH 1

$V_1 = 5\text{mA}(2\text{k}\Omega) = 10\text{V}$ what's V_1?

MESH 2

$40\text{V} + (2)(5\text{mA}) = 4\text{k}\Omega(V_{1x})$

MESH 3

$-20\text{V} + 8\text{k}\Omega(i_x) = V_x$ OK Not standard form.

3/10

(c) Solve your equations for v_x and i_x.

$v_x =$ 12.5V

$i_x =$ 4.065 mA

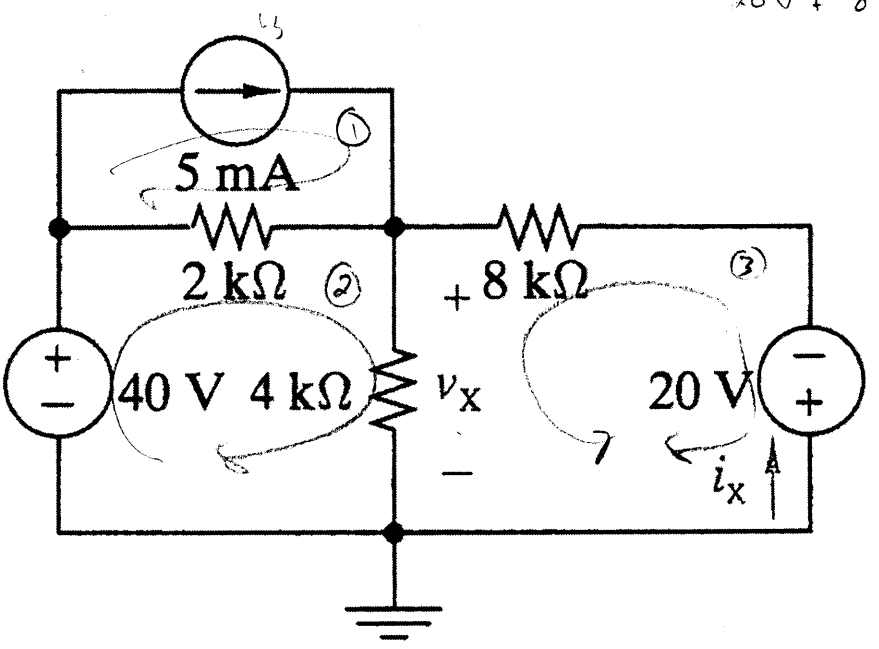
FOR V_x : $40\text{V} + 10\text{V} = 4\text{k}\Omega(V_{1x})$

$\Rightarrow V_x = 12.5\text{V}$

FOR $i_x \Rightarrow -20\text{V} + 8\text{k}\Omega(i_x) = 12.5\text{V}$

$\Rightarrow 8\text{k}\Omega(i_x) = 32.5\text{V}$

$\Rightarrow i_x = 4.065\text{mA}$



Name : Kate Moore Section: TA CWRU e-mail: KXM99

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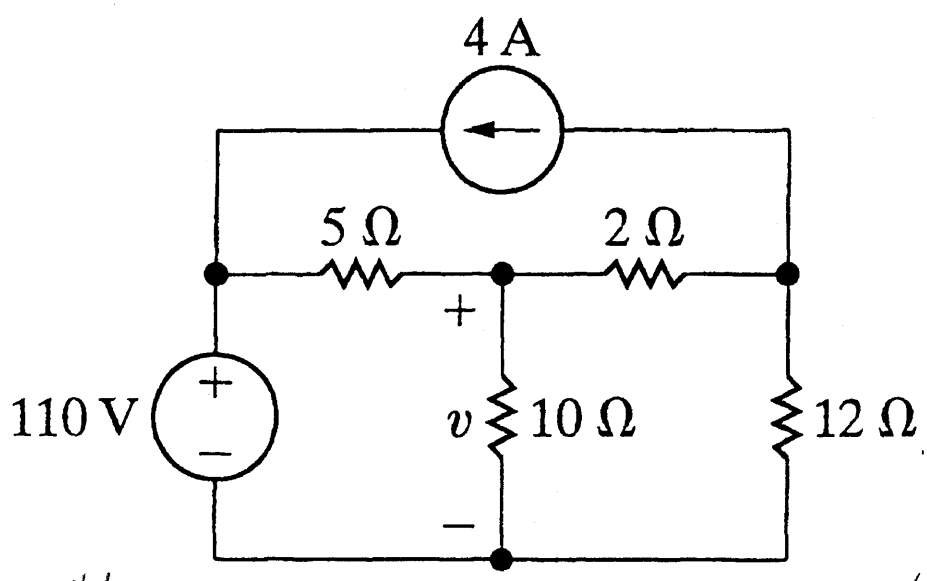
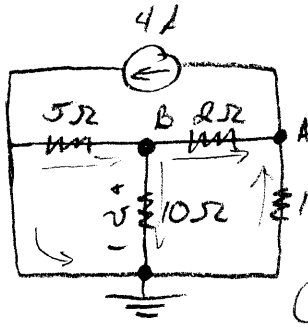
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = −24 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.23 ✓ volts

9.8
10





A/ $\frac{B-A}{2\Omega} + \frac{A-0}{12\Omega} = 4A$ ✓

$\frac{B}{2\Omega} - \frac{A}{2\Omega} + \frac{A}{12\Omega} = 4A$

$\frac{-5}{12\Omega}A + \frac{B}{2\Omega} = 4A_{mp}$

B/ $\frac{0-B}{5\Omega} - \frac{B-0}{10\Omega} - \frac{B-A}{2\Omega} = 0$

$\frac{2B}{10\Omega} - \frac{1B}{10\Omega} - \frac{5B}{10\Omega} + \frac{A}{2\Omega} = 0$

$\frac{1}{2\Omega}A - \frac{8}{5\Omega}B = 0$

$-\frac{1}{2\Omega}A + \frac{3}{5}B = 4.8\,A_{mp}$

$-\frac{1}{5\Omega}B = 4.8\,A_{mp}$

$B = v$ / $B = -24V = v$

math error −0.2

2c) $-i_A(6k\Omega) + i_B(18k\Omega) - i_C(12k\Omega) = -120V \;/\; i_A = 5mA$

$$i_B(18k\Omega) - i_C(12k\Omega) = -90V$$

$$-i_B(4k\Omega) + i_C(12k\Omega) = -20V$$

$$i_B(14k\Omega) = -110V$$

$$i_B = 7.86mA$$

$$-(7.86mA)(4k\Omega) + i_C(12k\Omega) = -20V$$

$$i_C = .95mA$$

Name : Elyse Shearer Section: WC CWRU e-mail: eas27

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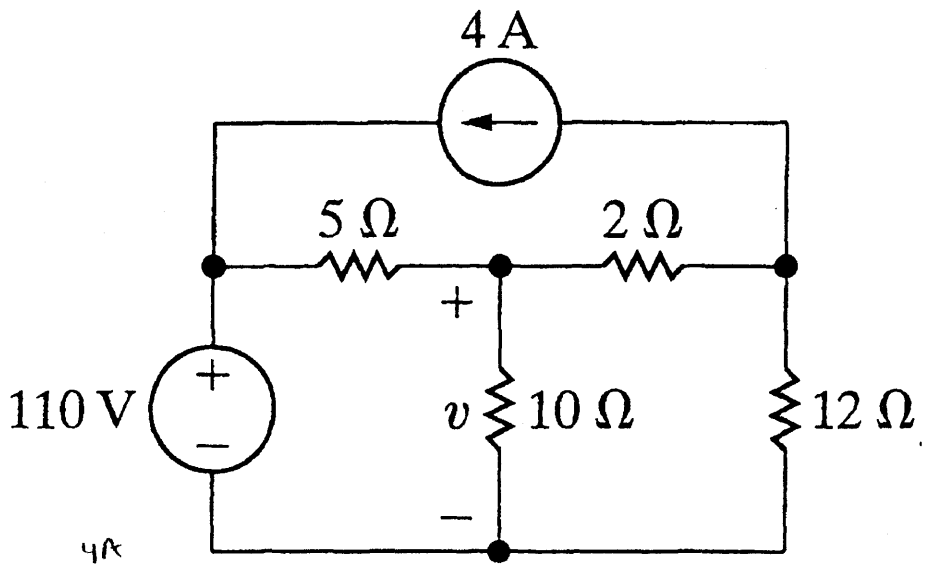
ENGR 210. Introduction to Circuits and Instruments (4)

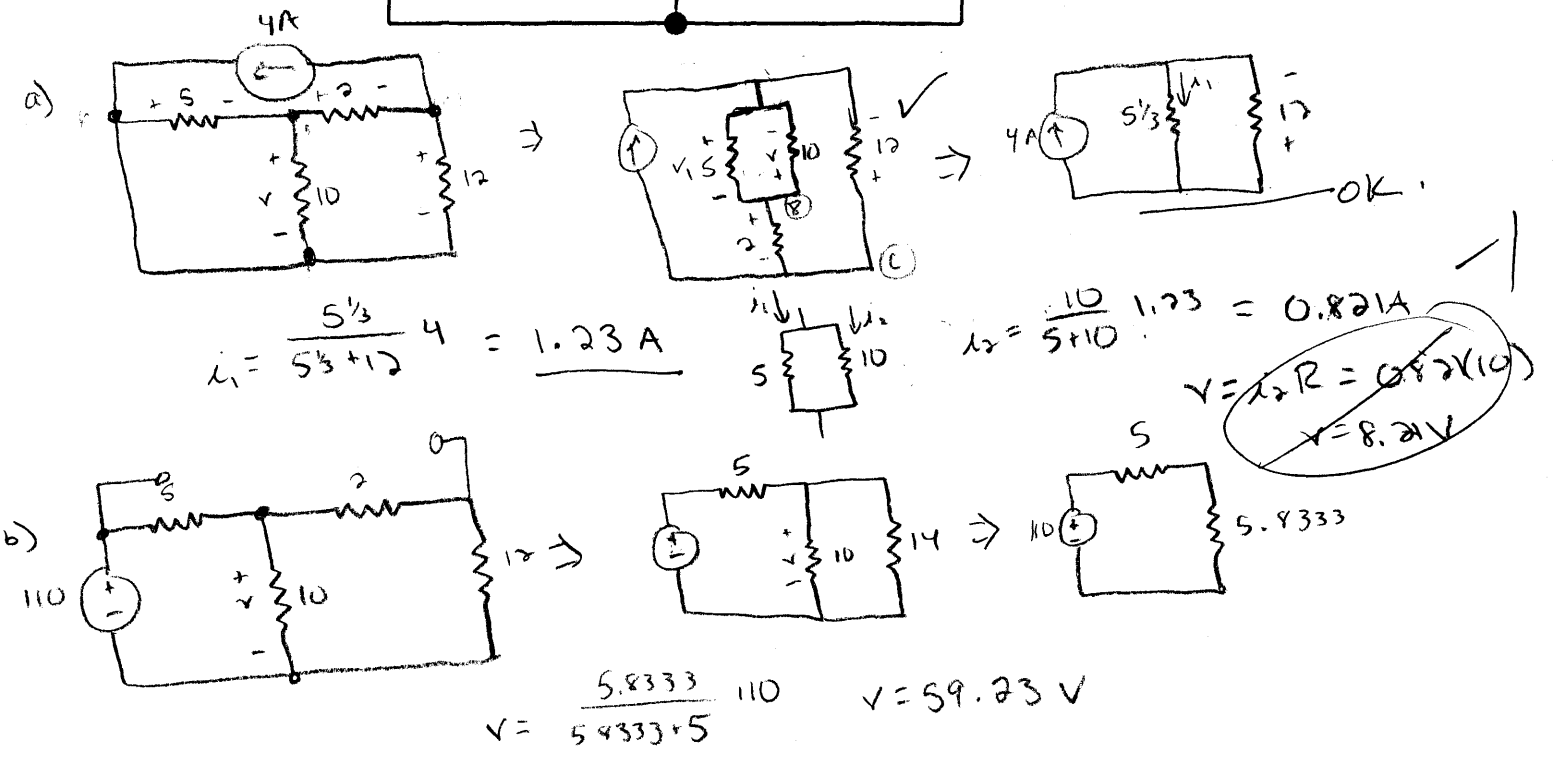
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 8.21 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.23 ✓ volts



9/10



1

Name : Elyse Shearer Section: WE CWRU e-mail: eas27

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

(A) $i_A = 5\text{mA}$ ✓

(B) $-40 + 2k(i_B - i_A) + 4k(i_B - i_C) = 0$

$-2000 i_A + 6000 i_B - 4000 i_C = 40$ ✓

(C) $4k(i_C - i_B) + 8k i_C - 20 = 0$

$-4000 i_B + 12000 i_C = 20$ ✓

7/10

(c) Solve your equations for v_x and i_x.

v_x = 8.58 V

i_x = 1.43 mA

$v_x = 4k(i_C - i_B)$

$i_x = i_C$

$i_B = 3i_C - 0.005$

$-10 + 6000(3i_C - 0.005) - 4000i_C = 40$

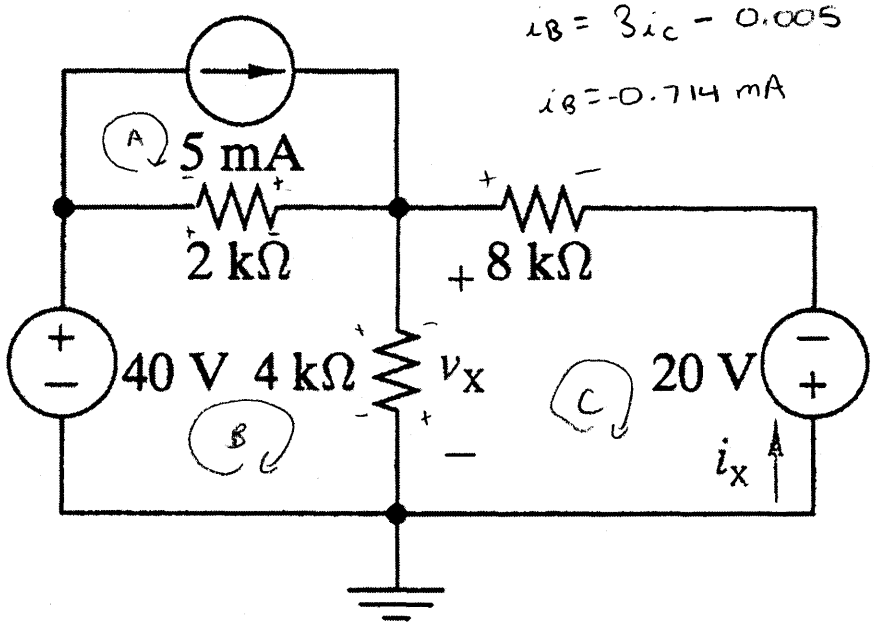
$14000 i_C = 20$

$i_C = 1.43\text{ mA}$

$i_B = -0.714\text{ mA}$

$v_x = 4000(1.43\text{mA} - (-0.714\text{mA}))$

$v_x = 8.58$



Name : Lindsey Stahl Section: TA CWRU e-mail: lms39

CASE WESTERN RESERVE UNIVERSITY
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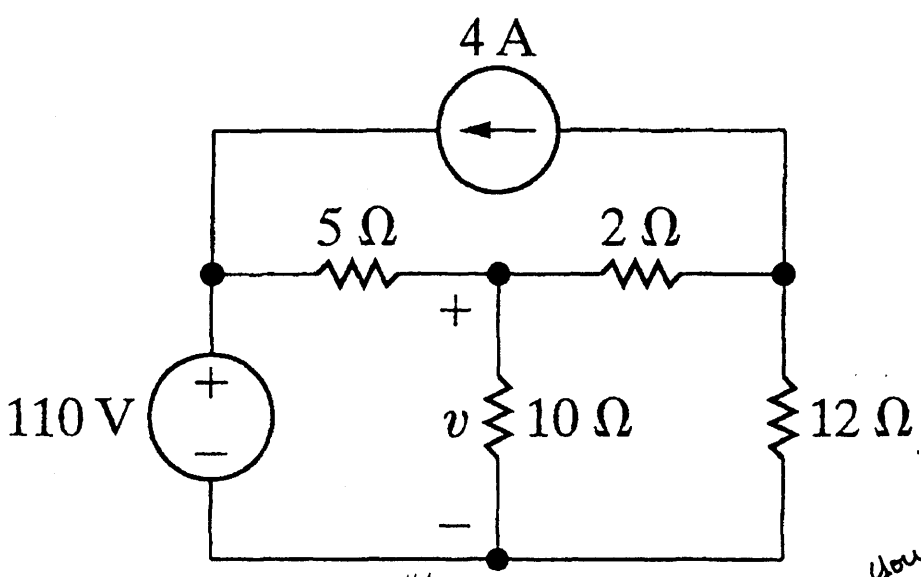
MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

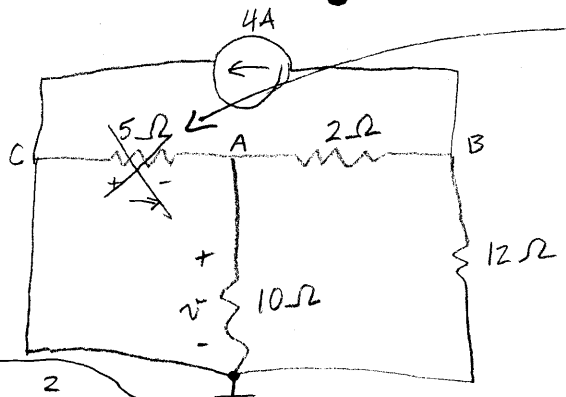
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 20 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 14 V volts

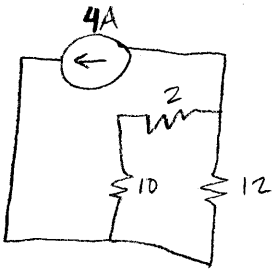
6/10



you can't get rid of the 5Ω resistor −3

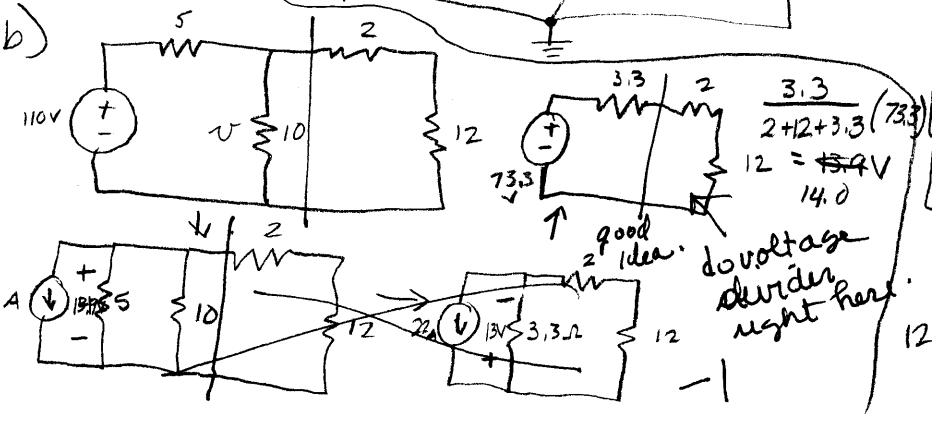
a)

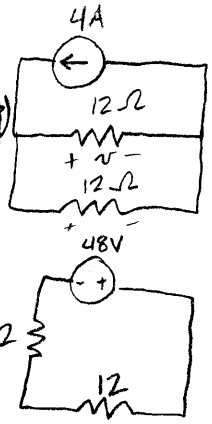




$\frac{10}{10+2}(24) = 20V$

b)





$\frac{12}{12+12}(48) = 24V$

−1

Name : Lindsey Stahl Section: TA CWRU e-mail: lms39

2. (10 points)

(a) How many meshes are there in the circuit given below. ~~2~~

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

$-i_A(4k) + i_x(4k) - i_A(2k) = 30$

$i_x(8k) + i_x(4k) - i_A(4k) = -20$

0/10

(c) Solve your equations for v_x and i_x.

v_x = 25 V

i_x = 4.29 mA

$-6k\,i_A + 4k\,i_x = 30$

$-4k\,i_A + 12k\,i_x = -20$

$24k\,i_A - 16k\,i_x = -120$

$-24k\,i_A + 72k\,i_x = -120$

$56k\,i_x = -240$

$i_x = 4.29\text{ mA}$

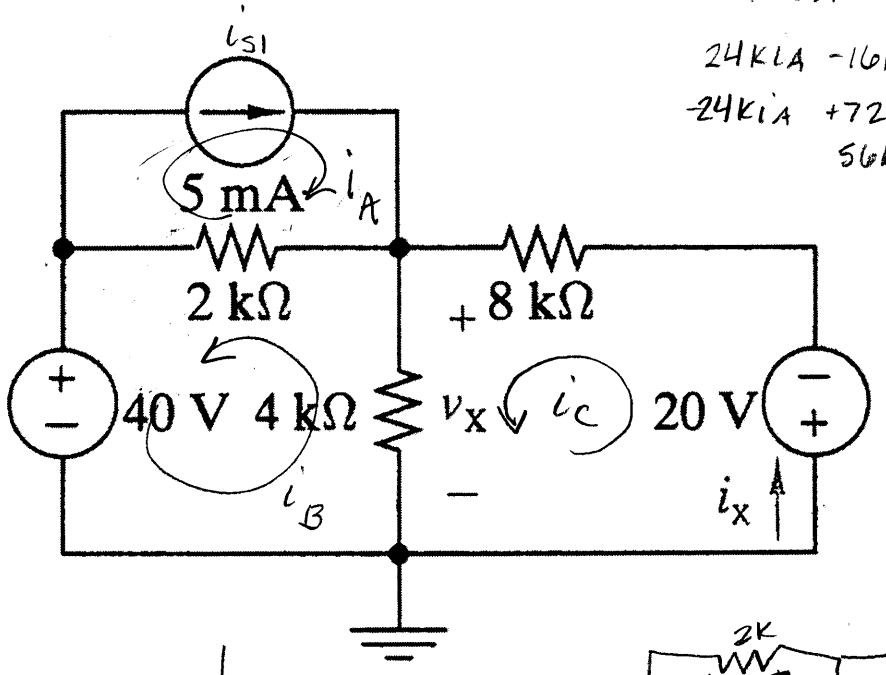
$-6k\,i_A + 4k(4.29\text{mA}) = 30$

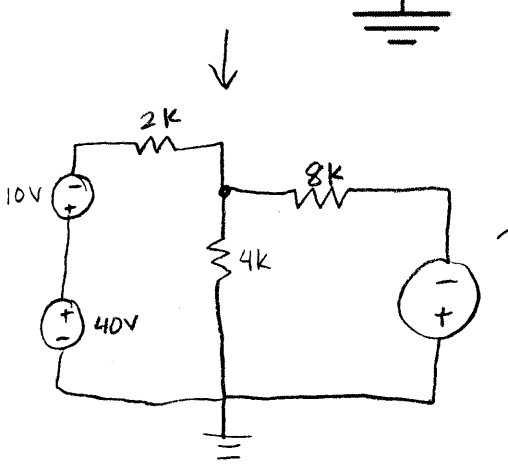
$i_A = -2.14\text{mA}$

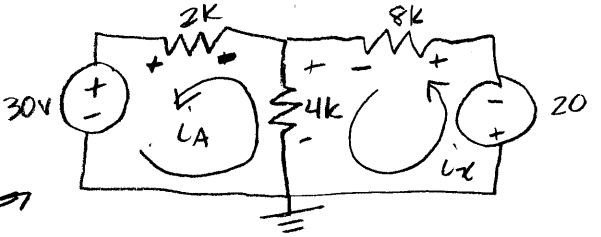
$V_x = (i_x - i_A)R$

$= (4.29 + 2.14)4$

$= 25\text{V}$







Name : SARAH ROVITO Section: WA CWRU e-mail: SMR32

CASE WESTERN RESERVE UNIVERSITY
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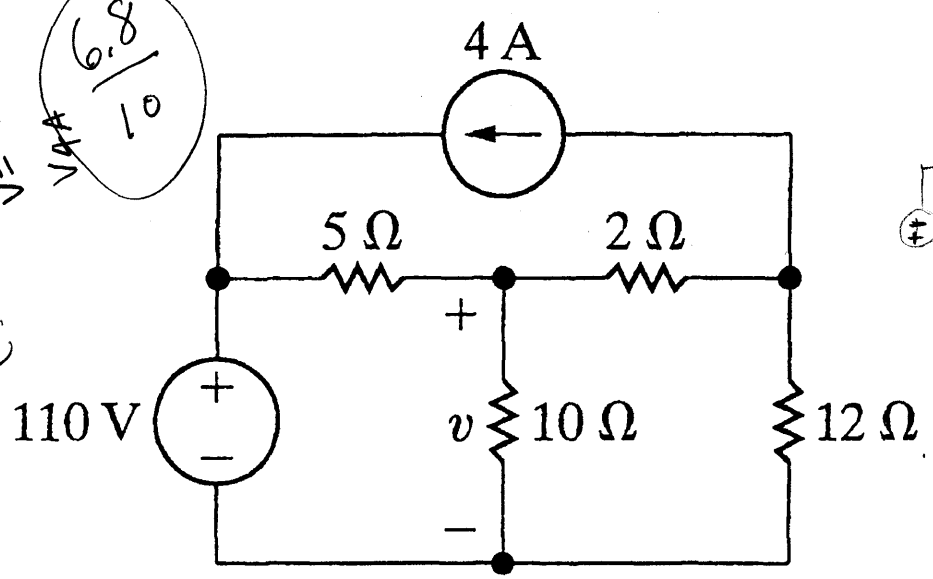
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

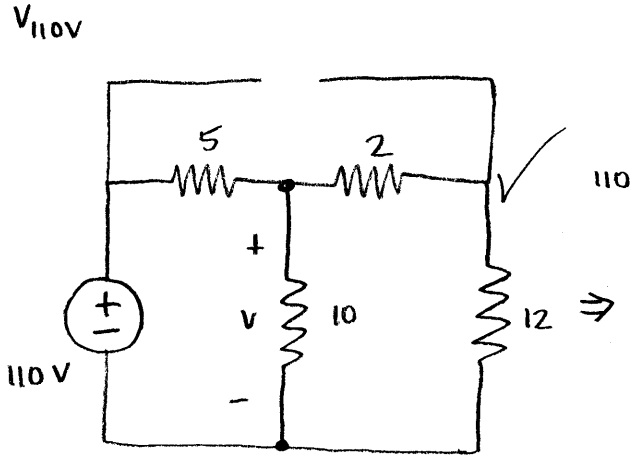
MAKE-UP QUIZ 1 **3/1/05**

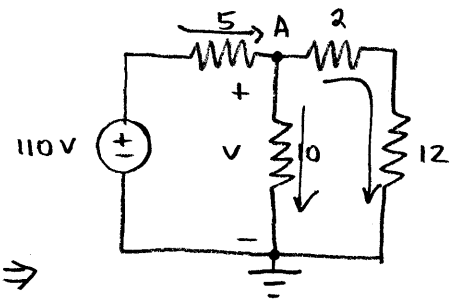
PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

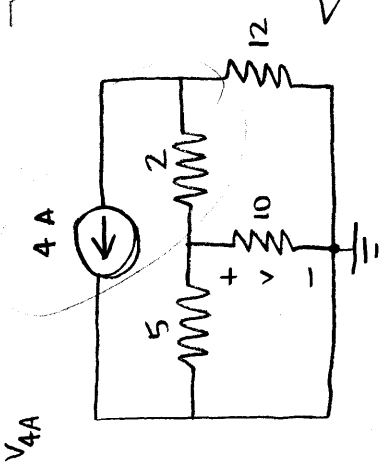
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
   v_{4A} = 7 V volts

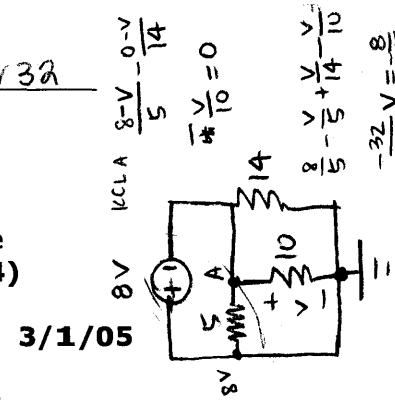
   b. find the contribution to v from the 110V voltage source
   v_{110V} = 96.25 V volts

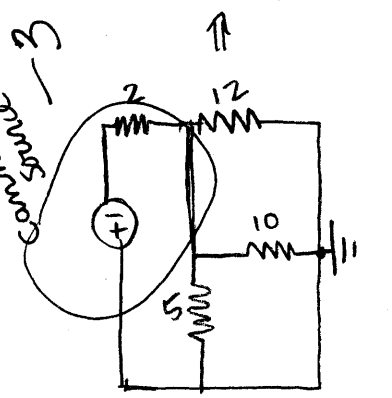












KCL A $\frac{110-V_A}{5\Omega} - \frac{V_A}{10\Omega} - \frac{0-V_A}{14\Omega} = 0$

$\frac{110-V}{5} - \frac{V}{10} + \frac{V}{14} = 0$

$-\frac{1}{5}V - \frac{1}{10}V + \frac{1}{14}V \rightarrow -\frac{28}{140} - \frac{14}{140} + \frac{10}{140}$

$-28-14+10 =$

$\frac{110}{5} - \frac{28V}{140} - \frac{14V}{140} + \frac{10V}{140} = 0$

$22 - \frac{32}{140}V = 0$

$\left(\frac{140}{32}\right)\frac{32}{140}V = 22\left(\frac{140}{32}\right)$

$V = 96.25\ V$

$\hookrightarrow V_{110V}$

-0.2 sign backwards

Name : SARAH ROVITO Section: WA CWRU e-mail: smr32

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 meshes ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

NOT passive sign convention

A $-40 + 2000(i_A - i_B) + 4000(i_A - i_C) = 0$

$2000i_A - 2000i_B - 4000i_A + 4000i_C = 40$

$-2000i_A - 2000i_B + 4000i_C = 40$

$i_B = 5\text{ mA} = 0.005\text{ A}$

$i_C = -i_X$

$i_A = i_B$

signs must be based on currents

B $2000(i_B - i_A) = 0$

$-2000i_A + 2000i_B = 0$

$i_A = i_B$ No. $i_B = 5\text{mA}$ by inspection.

C $-4000(i_C - i_A) + 8000i_C - 20 = 0$ ✓ → $-4000i_C + 4000i_A + 8000i_C = 20$

$4000i_A + 4000i_C = 20$

$i_A = \frac{20 - 4000i_C}{4000}$

$i_A = 0.005 - i_C \rightarrow i_C = 0.005 - i_A$

$i_A = i_B = 0.005\text{ A}$

$i_C = 0.005 - 0.005 = 0$

$i_C = 0 \therefore i_X = 0$ b/c

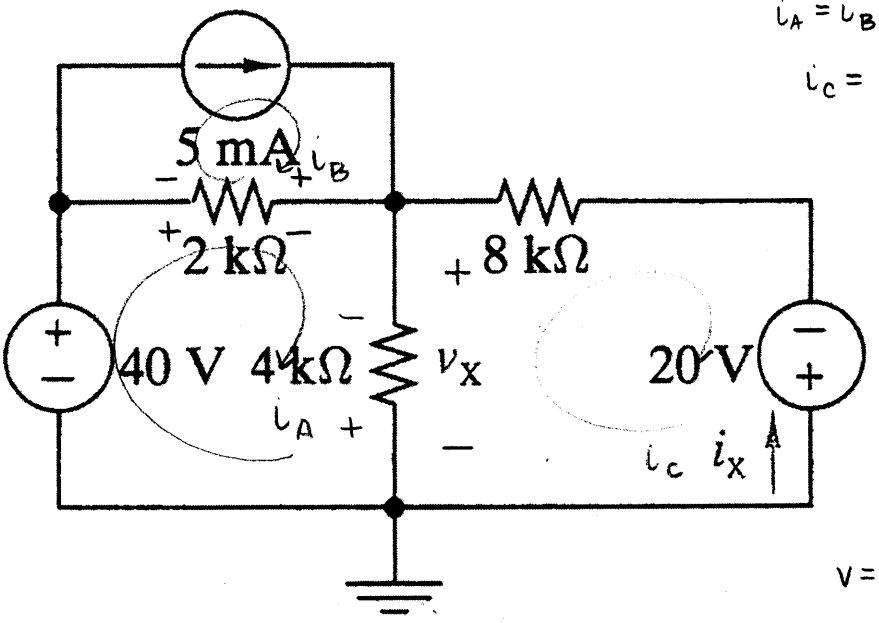
$i_X = -i_C$

5/10

(c) Solve your equations for v_x and i_x.

$v_x =$ −20 V

$i_x =$ 0



$V = iR$

$V_x = (4000\,\Omega)(-i_C - i_A)$

$V_x = (4000\,\Omega)(0 - 0.005\,A)$

$V_x = -20V$

A $-40\text{ V} + 2000(i_A - i_B) - 4000(i_A - i_C) = 0$

B $2000(i_B - i_A) = 0$

C $-4000(i_C - i_A) + 8000i_C - 20 = 0$

Name : Jennifer Rischer Section: TA CWRU e-mail: jmr44

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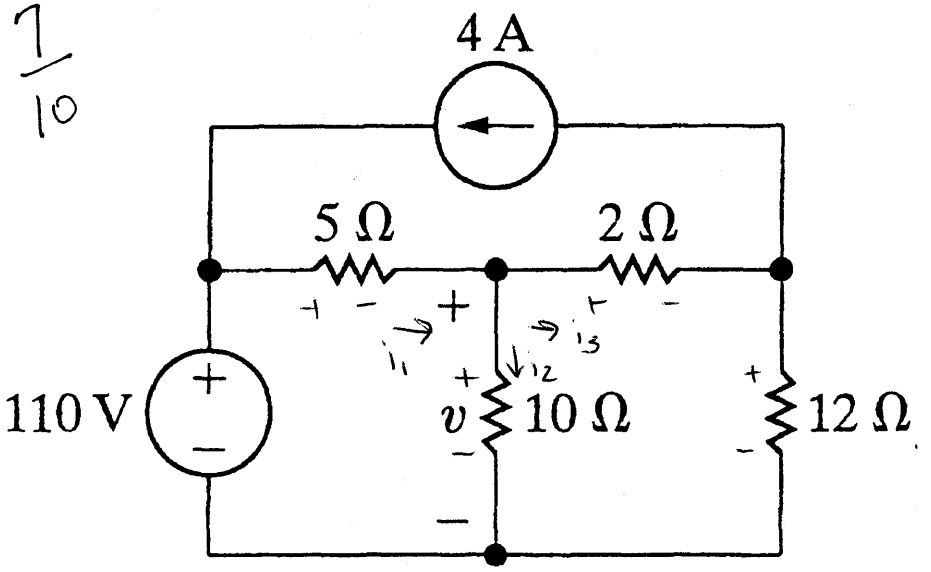
MAKE-UP QUIZ 1 **3/1/05**

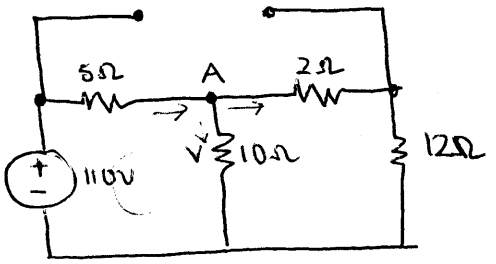
PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

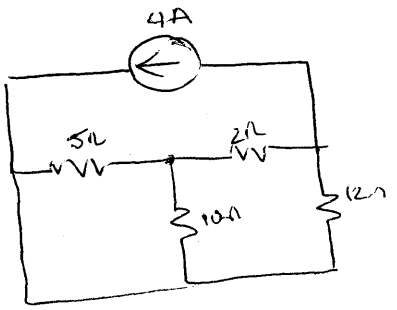
1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 10V volts

   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.2 V volts

7/10







$5\Omega i_1 + 10\Omega i_2 = 110V$

$2\Omega i_3 + 12\Omega i_3 = 10\Omega i_2$

$i_1 = i_2 + i_3$

$5\Omega(i_2 + i_3) + 10\Omega i_2 = 110V$

$15\Omega i_2 + 5\Omega i_3 = 110V$

$14\Omega i_3 = 10\Omega i_2$

$\frac{10\Omega}{14\Omega} i_2 = i_3$

$15\Omega i_2 + 5\left(\frac{10\Omega}{14\Omega}\right) i_2 = 110V$

$i_2 = 5.92A$

$10\Omega i_2 = V_{10V}$

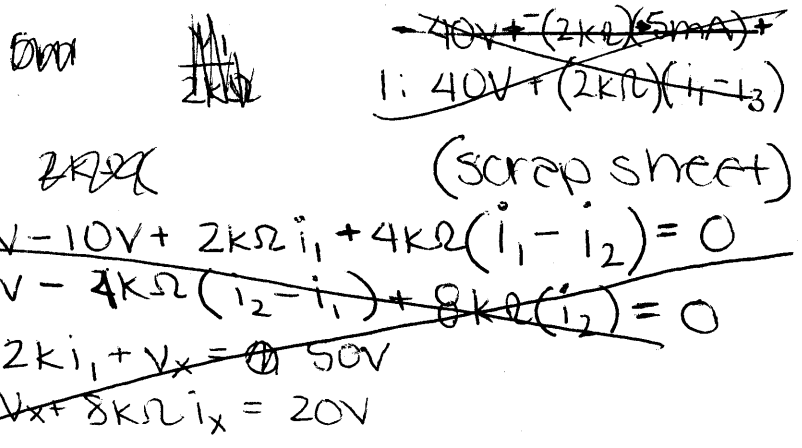
$V_{110V} = 59.2V$

Name : Jennifer Rischer Section: 1A CWRU e-mail: jmr44

2. (10 points)

(a) How many meshes are there in the circuit given below. 2

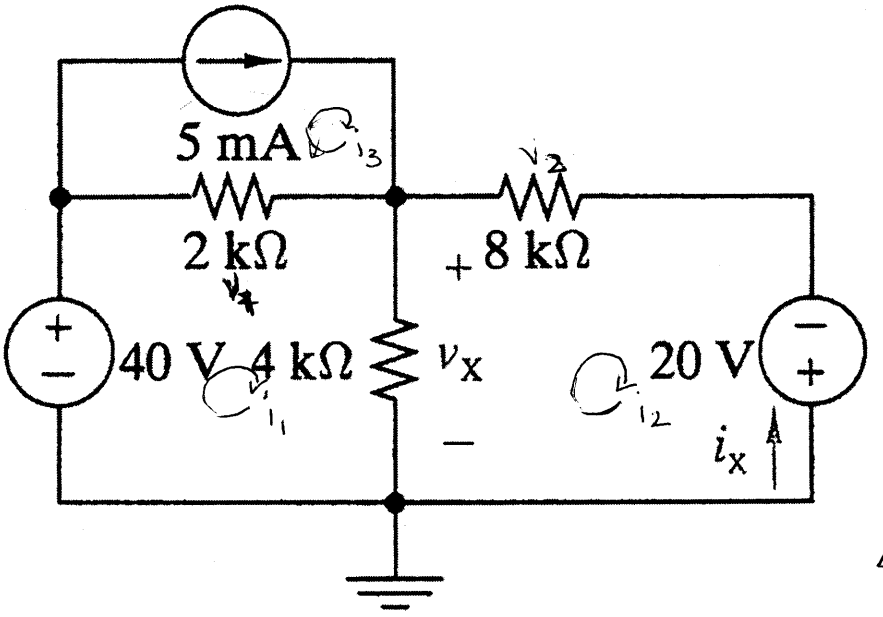
(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.



(c) Solve your equations for v_x and i_x.

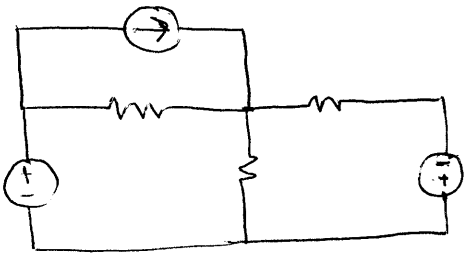
v_x = 40V

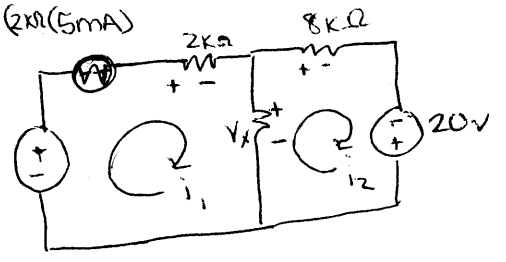
i_x = 2.5mA



$i_2 = -i_x$ ✓

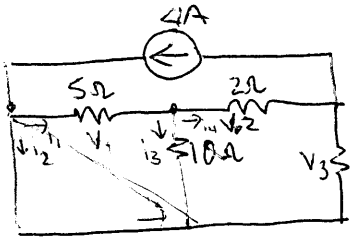
$4k\Omega(i_1 - i_2) = V_x$

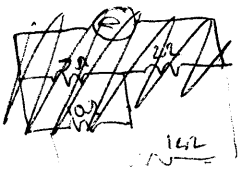


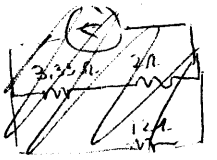


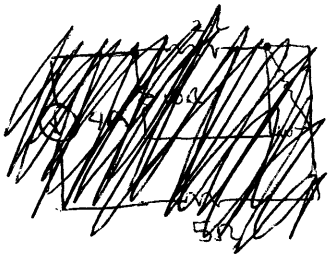
Jennifer Rischer
TA
jmr44

1.)









12V

$i_2 = i_4 + i_3$ $\quad i_1 = i_2$

$i_1 = i_4 + i_3$

$V_1 = V$

$i_1 + i_2 = 4A \quad i_1 = 2A$

$V_1 = (2A)(5\Omega)$

$V_{4A} = 10V$

Not clear what you did to get V_{4A}.

$-3.$

Jennifer Rischar
TA
jmr44

2.) $-40V + 2k\Omega(i_1 - i_3) + 4k\Omega(i_1 - i_2) = 0$ ✓ (V_x)

$-2k\Omega(i_3 - i_1) = 0$ ✓ $i_3 = 5mA$

$i_1 = 5mA$

$-20V$ (sign) $+ 4k\Omega(i_2 - i_1) + 8k\Omega(i_2) = 0$ ✓

$40V = 2k\Omega i_1 - 2k\Omega i_3 + V_x$

$V_x + 8k\Omega i_2) = 20V$

$i_3 = 5mA$ ✓

$-2k\Omega(i_3 - i_1) = 0$ ✗ $i_2 = -i_x$

$i_1 = 5mA$.

6.5

10

b) $40V = 2k\Omega(5mA) - 2k\Omega(5mA) + V_x$

$V_x = 40V$

$V_x + 8k\Omega(-i_x) = 20V$

$V_x + -8i_x = 20V$

$V_x - 8i_x = 20V$

$20V = 8i_x$ $i_x = 2.5mA$

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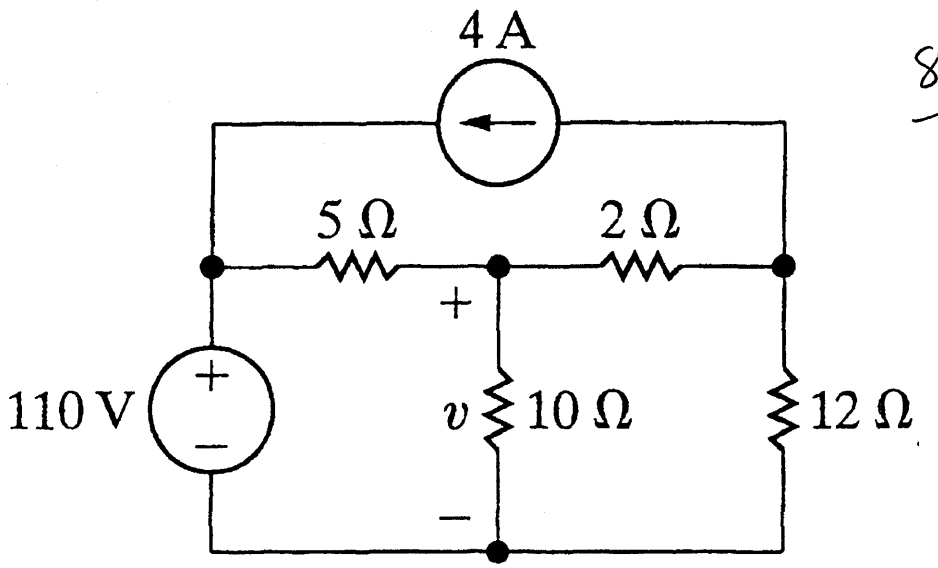
CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

MAKE-UP QUIZ 1 **3/1/05**

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE. BE SURE TO STATE ANY ASSUMPTIONS

1. (10 points) Using superposition
   a. find the contribution to v from the 4A current source
      v_{4A} = 10.4348 volts
   b. find the contribution to v from the 110V voltage source
      v_{110V} = 59.2308 volts



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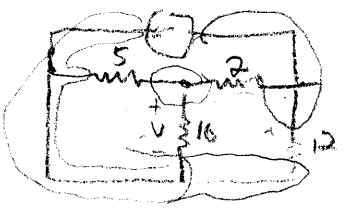
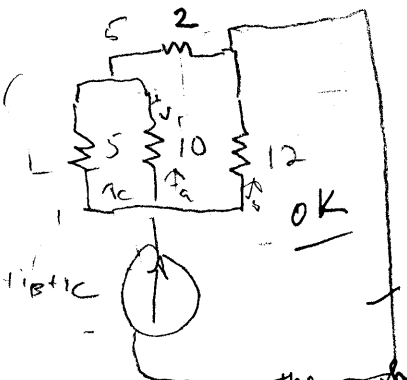
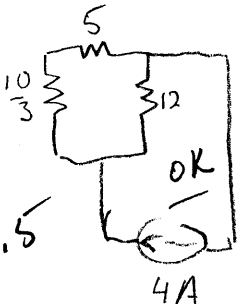
a)





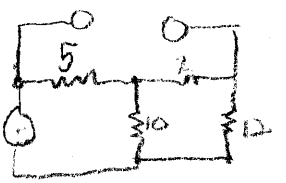


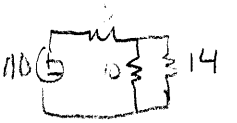
$i_s = i_c + i_B + i_c$

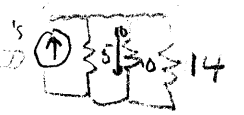
You want the current through the 10Ω resistor

$V = i_o R \rightarrow V = \frac{24}{23} \cdot 10 = 10.4348V$

b)







$i_o = \frac{\frac{1}{10}}{\frac{1}{5}+\frac{1}{10}+\frac{1}{14}} \cdot 22$

$i_o = 77/13$

$= \frac{\frac{1}{10}}{\frac{1}{5}+\frac{1}{10}+\frac{1}{12}} 4A = i_o \cdot \frac{24}{23} A$ $V = i_o \cdot R$

$V_{10} = 77/13 \cdot 10\Omega$

$V_1 = 59.2308V$

Name : Russell Tischer Section: ME CWRU e-mail: rct6

2. (10 points)

(a) How many meshes are there in the circuit given below. 3 ✓

(b) Write a complete set of mesh current equations for this circuit below. Put your equations into standard form.

$I_C = 5\,mA$ ✓

Mesh C: $2^{k\Omega}(I_C - I_B) = 5\,mA$

Mesh B: $2^{k\Omega}(I_B - I_C) + 4^{k\Omega}(I_B - I_A) - 40 = 0$ ✓

Mesh C: $4^{k\Omega}(I_A - I_B) + 8^{k\Omega} I_A - 20 = 0$ ✓

$I_A = 15.714\,mA$

$I_B = 12.14\,mA$

$I_C = 5\,mA$

7/10

(c) Solve your equations for v_x and i_x.

v_x = 25.716 V

i_x = −5.714 mA

$V_x = (I_B - I_A)\cdot 4\Omega$

$i_x = -i_A$

$V_x = (0.214 - 0.005714)\,4000$

$V_x = 25.716\,V$