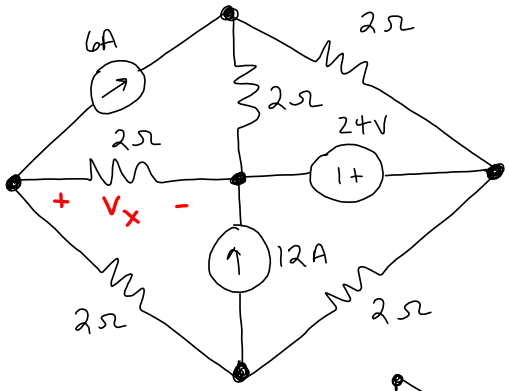
Exam 1 : Wednesday 2/12

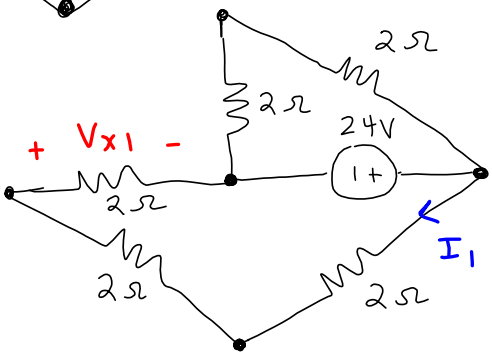
pencils, erasers, calculator

3" x 5" any two side handwritten notes

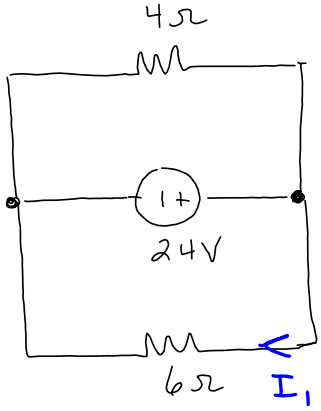
Use superposition to find V_x.



24 V - ON

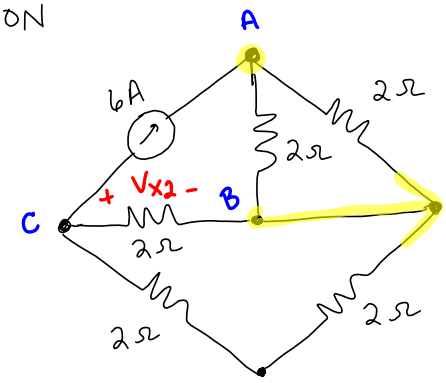


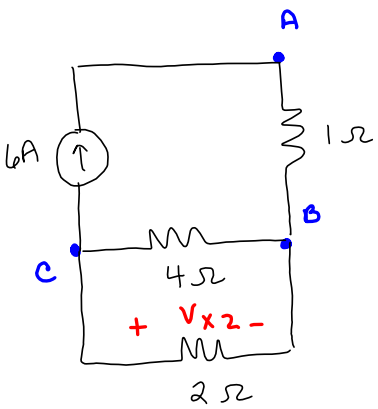
$V_{x1} = I_1 \cdot 2 = 8V$

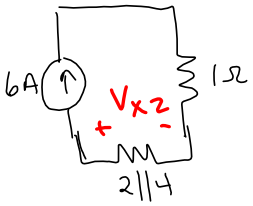


$I_1 = \frac{24}{6} = 4A$

6A - ON



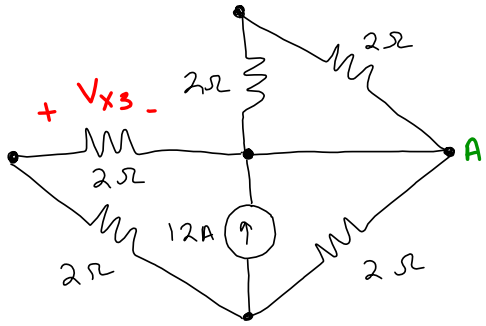


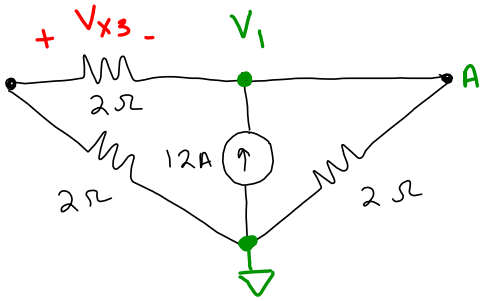


$V_{x2} = -6\,(4||2)$

$V_{x2} = -8V$

12A ON





$$V_{x3} = -\left(\frac{V_1}{4}\right)(2)$$

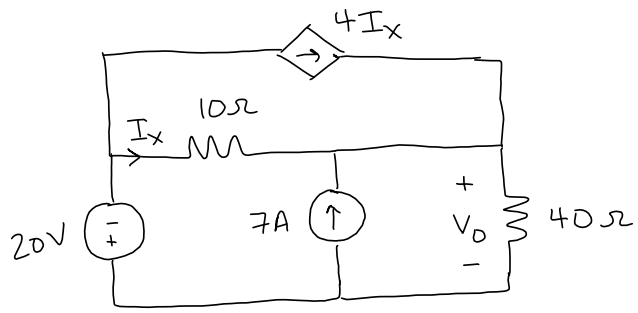
$$\boxed{V_{x3} = -8V}$$

$$\frac{V_1}{2} + (-12) + \frac{V_1}{4} = 0$$

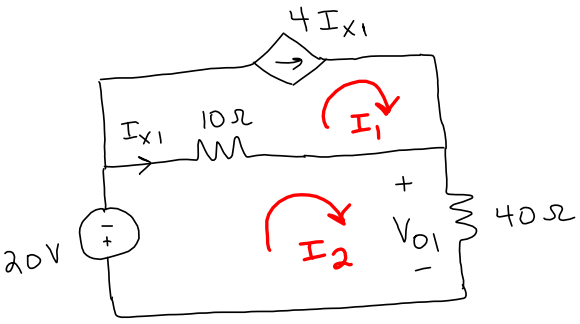
$$V_1 = 16V$$

$$V_x = V_{x1} + V_{x2} + V_{x3} = -8 + 8 - 8 = -8V$$

Find V_o using superposition.



20V. ON



Know:

$I_1 = 4 I_{x1}$

$I_{x1} = I_2 - I_1$

$V_{o1} = 40 I_2$

m1: Don't need.

m2: $-20 - 10(I_2 - I_1) - 40 I_2 = 0$

$10 I_1 - 50 I_2 = 20$

$I_1 = 4(I_2 - I_1)$

$5 I_1 - 4 I_2 = 0$

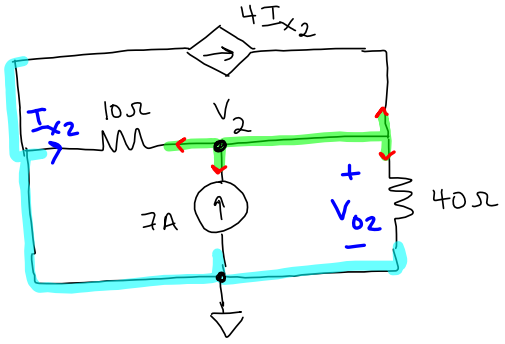
$I_1 = -0.48\ A$

$I_2 = -0.38\ A$

$V_{o1} = 40 I_2$

$V_{o1} = -19.05\ V$

7A ON



$$I_{x2} = \frac{0 - V_2}{10} = -\frac{V_2}{10}$$

$$\frac{V_2}{10} + (-7) + \frac{V_2}{40} + (-4I_{x2}) = 0 \qquad -I_{x2} = \frac{V_2}{10}$$

$$V_2(.525) = 7$$

$$V_2 = 13.33\text{V}$$

$$V_{02} = V_2$$

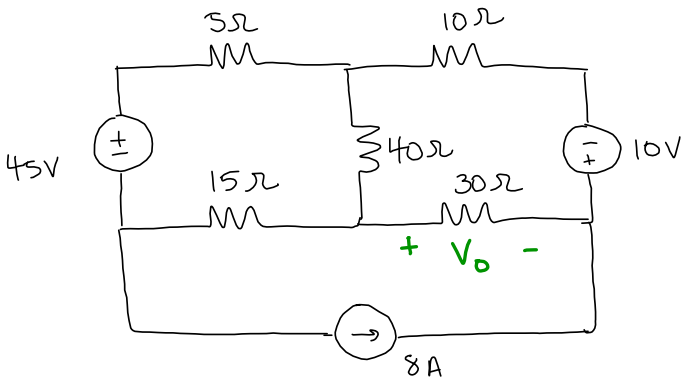
$$\boxed{V_{02} = 13.33\text{V}}$$

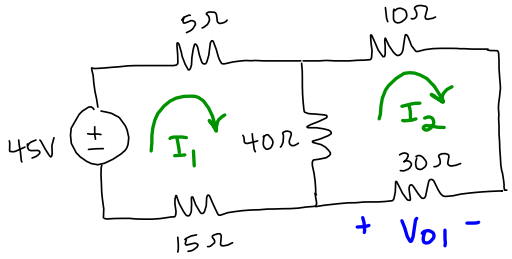
$$V_0 = V_{01} + V_{02}$$

$$= -19.05 + 13.33$$

$$\boxed{V_0 = -5.72\text{V}}$$

Find V_o using superposition.





Know: $V_{o1} = -30 I_2$

m1: $45 - 5I_1 - 40(I_1 - I_2) - 15I_1 = 0$

m2: $-40(I_2 - I_1) - 10I_2 - 30I_2 = 0$

$2(-60I_1 + 40I_2 = -45)$

$40I_1 - 80I_2 = 0$

$-80I_1 = -90$

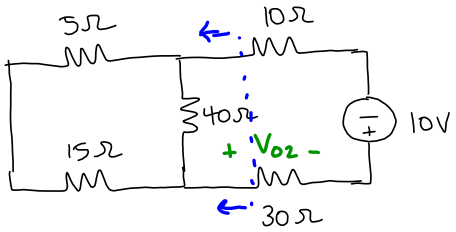
$I_1 = \frac{9}{8} = 1.125\,A$

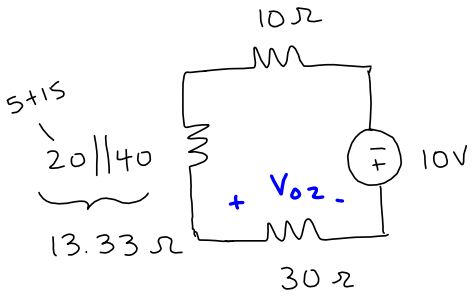
$I_2 = \frac{1}{2} I_1$

$= 0.5625\,A$

$V_{o1} = -16.88\,V$

10V ON

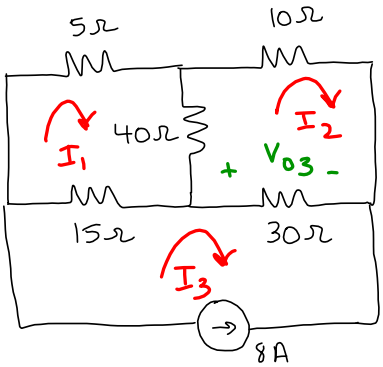




$$V_{02} = -10\left(\frac{30}{53.33}\right)$$

$$\boxed{V_{02} = -5.625\ V}$$

8A ON



$I_3 = -8A$

$V_{03} = 30(I_3 - I_2)$

$I_1 = -6A$

$I_2 = -6A$

$V_{03} = -60V$

m1: $-5I_1 - 40(I_1 - I_2) - 15(I_1 - I_3) = 0$

m2: $-10I_2 - 30(I_2 - I_3) - 40(I_2 - I_1) = 0$ $V_0 = -82.51\ V$