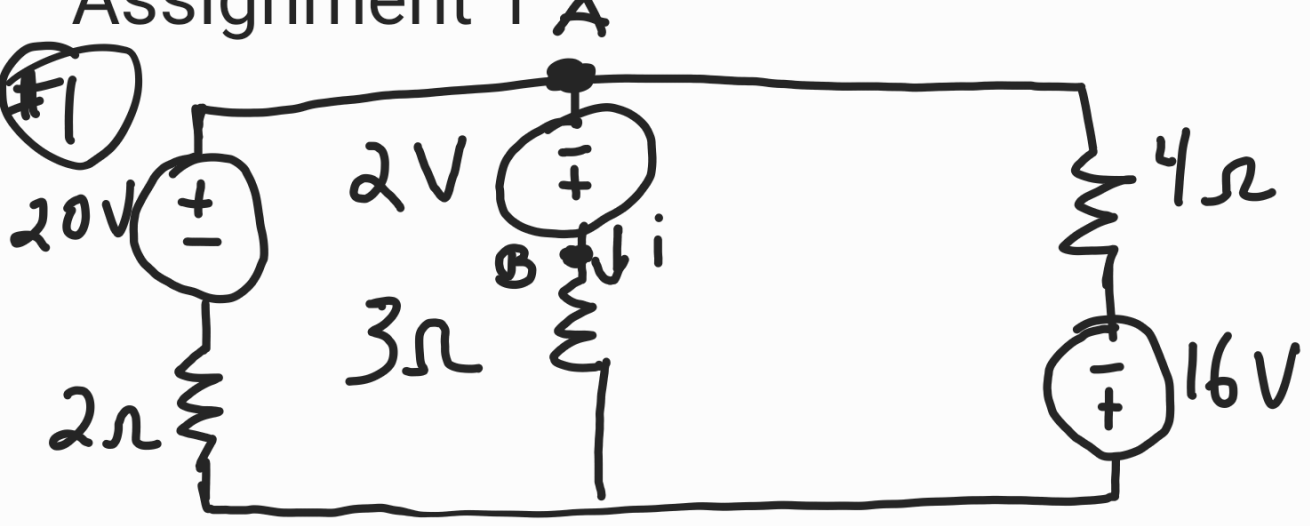
Assignment 1



KCL @ A

$$\frac{V_a-20}{2}+\frac{V_a+2}{4}+\frac{V_a+16}{4}=0$$

$$\frac{2V_a-40}{4}$$

$$\frac{4V_a-22}{4}=0$$

$$4V_a-22=0$$

$$V_a=5.5$$

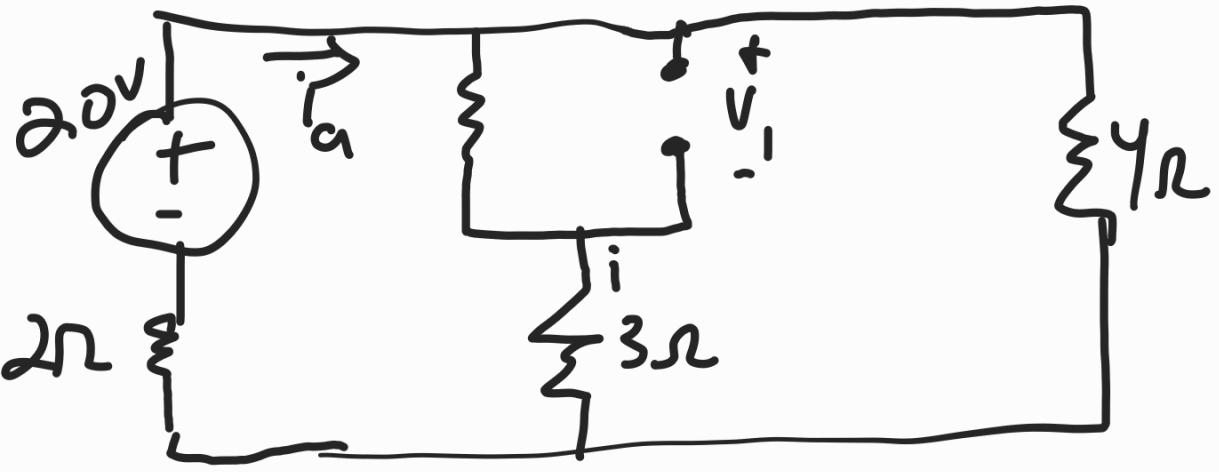
$$i=\frac{V_a+2}{4}=\boxed{1.875\ A}$$

$$V_b=1.875\cdot 3=5.625$$

$V_{a-b} = .125\ V$

$P_{2A} = 2A \cdot V_{a-b} = \boxed{.25\ W}$

(#2) Remove 2A and 16V (1)



$R = 2 + 4 \| 4 = 4\ \Omega$

$i_a = 20/R = 5A$

$i = \frac{i_a \times 4}{4+4} = 2.5A$

$V_1 = i \times 1 = 2.5\ V$

Remove 20 V and 16V (2)

KCL

$$\frac{v}{2} + \frac{v}{4} + \frac{v-2}{4} = 0$$

$$\frac{2v}{4}$$

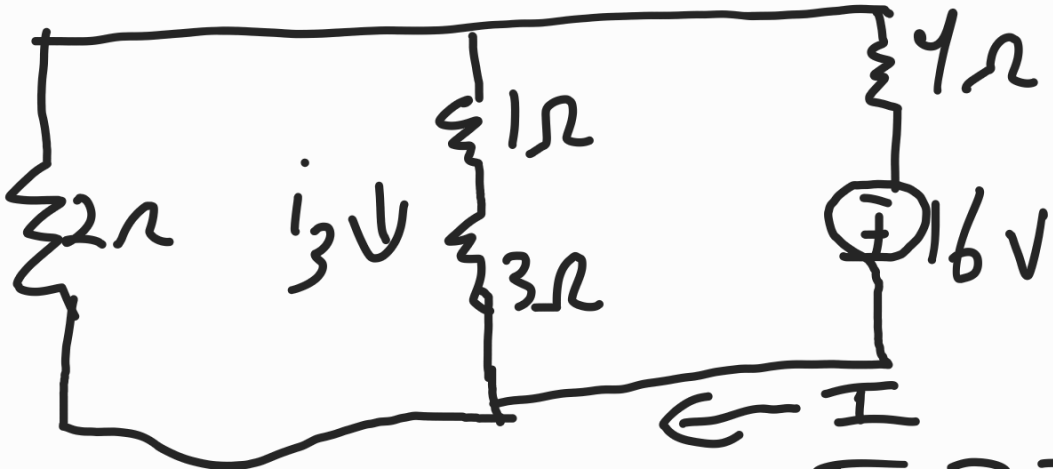
$$\frac{4v-2}{4} = 0$$

$$v = 1/2\ V$$

$$-i_2 = \frac{v-2}{4} = -.375\ A \Rightarrow i_2 = .375A$$

$$V_2 = -1(2-.375) = -1.62\ V$$

Remove 20V and 2A (3)



$R = 4 + 2\|4 = 5.333$

$I = 16/(32/6) = 3\ A$

$i_3 = -\frac{2}{6} \times 3 = -1\ A$

$V_3 = -1\ V$

$I = 2.5 + .375 - 1$

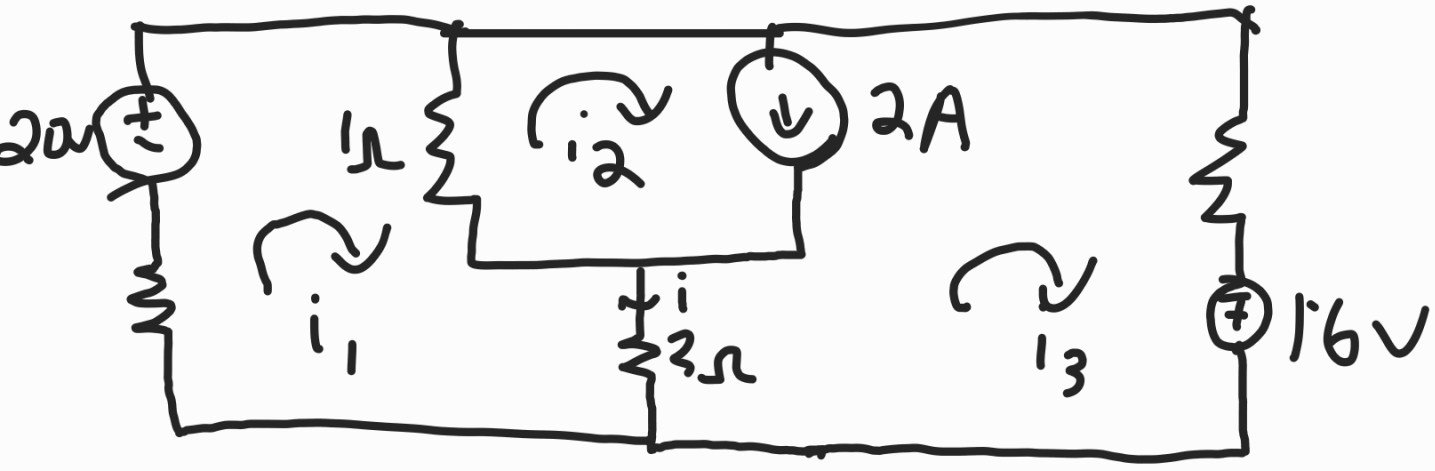
$= \boxed{1.875\ A}$

$V = V_1 + V_2 + V_3 = -.125$

$P = VI = \boxed{.25\ W}$

#3

$$R_{Th} = 1 + 2 \| 4 = {}^{14}/_{6} = 2.33\Omega$$



Mesh Method

$$2i_1 - 20 + 1(i_1 - i_2) + 3(i_1 - i_3) = 0$$

$$6i_1 - 1i_2 - 3i_3 = 20 \quad (1)$$

Super Mesh

$$1(i_2 - i_1) + 4i_3 - 16 + 3(i_3 - i_1) = 0$$

$$1i_2 + 7i_3 - 4i_1 = 16 \quad (2)$$

From Circuit

$$i_2 - i_3 = 2 \quad (3)$$

$$\Rightarrow i_2 = 2 + {}^{1}/_{2} i_3 + {}^{2}/_{1}$$

$i_2 = 2 + i_3$

$2 + i_3 + 7i_3 - 4i_1 = 16$

$8i_3 = 4i_1 + 14$

$i_3 = \frac{1}{2}i_1 + \frac{7}{4}$

① $6i_1 - (2 + \frac{1}{2}i_1 + \frac{7}{4}) - 3(\frac{1}{2}i_1 + \frac{7}{4}) = 20$

$6i_1 - 2 - \frac{1}{2}i_1 - \frac{7}{4} - \frac{3}{2}i_1 - \frac{21}{4} = 20$

$4i_1 - 9 = 20$

$i_1 = 7.25\ A$

$i_2 = 2 + \frac{1}{2}i_1 + \frac{7}{4} = 7.375\ A$

$V_1 = 7\Omega \cdot 5.375\ A$

$i_3 = 12 i_1 + 14 = 3.375$ A

$i_{ab} = i_{3\Omega} = i_1 - i_3 = 1.875$ A

Out of the 3 methods, I would recommend the source transformation, it was the easier method to me.

#4