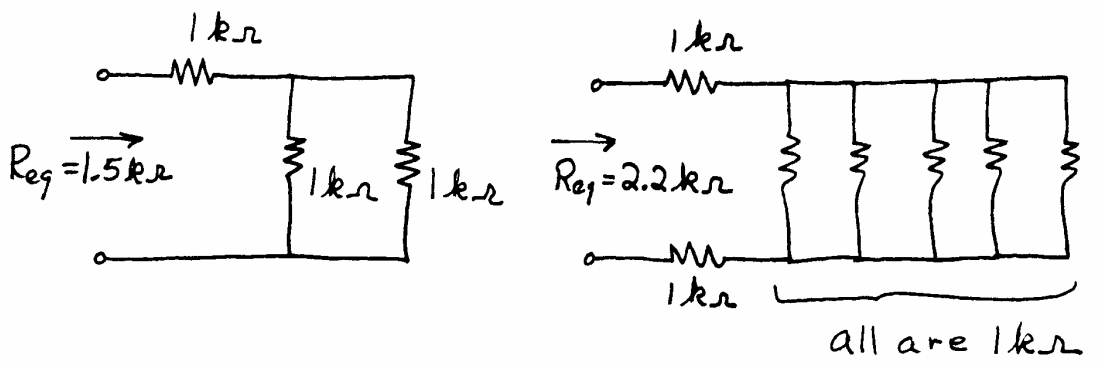
Homework # 2

P2.1* (a) $R_{eq} = 25\,\Omega$ (b) $R_{eq} = 25\,\Omega$

P2.7* The 2-Ω and 4-Ω resistances are in parallel having an equivalent resistance of 1.333 Ω. Similarly, the 1-Ω and 3-Ω resistances are in parallel and have an equivalent resistance of 0.75 Ω. Finally, the two parallel combinations are in series and we have

$$R_{ab} = 1.333 + 0.75 = 2.0833\ \Omega$$

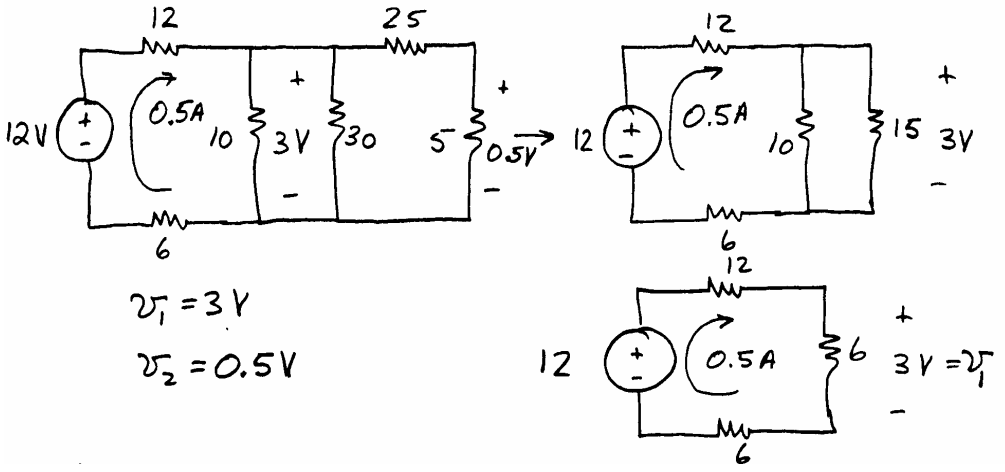
P2.9*



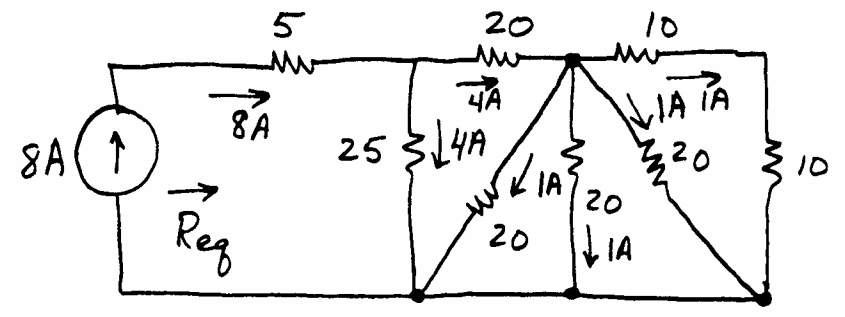
P2.13* The 20-Ω and 30-Ω resistances are in parallel and have an equivalent resistance of R_{eq1} = 12 Ω. Also the 40-Ω and 60-Ω resistances are in parallel with an equivalent resistance of R_{eq2} = 24 Ω. Next we see that R_{eq1} and the 4-Ω resistor are in series and have an equivalent resistance of R_{eq3} = 4 + R_{eq1} = 16 Ω. Finally R_{eq3} and R_{eq2} are in parallel and the overall equivalent resistance is

$$R_{ab} = \frac{1}{1/R_{eq1} + 1/R_{eq2}} = 9.6\,\Omega$$

P2.18* We combine resistances in series and parallel until the circuit becomes an equivalent resistance across the voltage source. Then we solve the simplified circuit and transfer information back along the chain of equivalents until we have found the desired results.



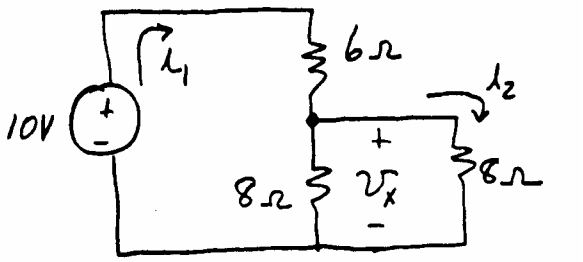
P2.20* Combining resistors in series and parallel, we find that the equivalent resistance seen by the current source is $R_{eq} = 17.5\ \Omega$. Thus, $v = 8 \times 17.5 = 140$ V. Also, $i = 1$ A.



P2.21* $i_1 = \dfrac{10}{R_{eq}} = \dfrac{10}{10} = 1$ A

$v_x = 4$ V

$i_2 = \dfrac{v_x}{8} = 0.5$ A



P2.26* $R_{eq} = \dfrac{1}{1/5 + 1/15} = 3.75\ \Omega$ $\quad v_x = 2\text{ A} \times R_{eq} = 7.5$ V

$i_1 = v_x/5 = 1.5$ A $\quad i_2 = v_x/15 = 0.5$ A

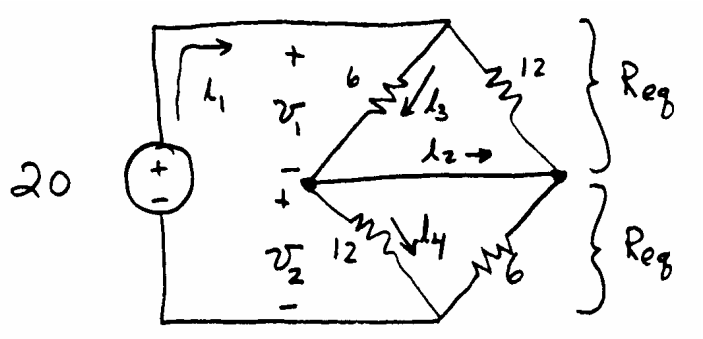
$P_{4A} = 4 \times 7.5 = 30$ W delivering

$P_{2A} = 2 \times 7.5 = 15$ W absorbing

$P_{5\Omega} = 7.5^2/5 = 11.25$ W absorbing

$P_{15\Omega} = (7.5)^2/15 = 3.75$ W absorbing

P2.28*



$$R_{eq} = \frac{1}{1/6 + 1/12} = 4\ \Omega \qquad i_1 = \frac{20\text{ V}}{2R_{eq}} = 2.5\ A$$

$$v_1 = v_2 = R_{eq} i_1 = 10\text{ V} \qquad i_3 = 10/6 = 1.667\ A$$

$$i_4 = 10/12 = 0.8333\ A \qquad i_2 = i_3 - i_4 = 0.8333\ A$$