P2.34* $R_{eq} = \dfrac{1}{1/5 + 1/15} = 3.75\,\Omega \qquad v_x = 2\,A \times R_{eq} = 7.5\,\text{V}$

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

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

P2.36* $v_1 = \dfrac{R_1}{R_1 + R_2 + R_3} \times v_s = 5\,\text{V} \qquad v_2 = \dfrac{R_2}{R_1 + R_2 + R_3} \times v_s = 7\,\text{V}$

$v_3 = \dfrac{R_3}{R_1 + R_2 + R_3} \times v_s = 13\,\text{V}$

P2.37* $i_1 = \dfrac{R_2}{R_1 + R_2} i_s = 1\,A \qquad i_2 = \dfrac{R_1}{R_1 + R_2} i_s = 2\,A$

P2.48* At node 1 we have: $\frac{v_1}{20} + \frac{v_1 - v_2}{10} = 1$

At node 2 we have: $\frac{v_2}{5} + \frac{v_2 - v_1}{10} = 2$

In standard form, the equations become

$$0.15v_1 - 0.1v_2 = 1$$

$$-0.1v_1 + 0.3v_2 = 2$$

Solving, we find $v_1 = 14.29$ V and $v_2 = 11.43$ V.

Then we have $i_1 = \frac{v_1 - v_2}{10} = 0.2857$ A.

P2.49* Writing a KVL equation, we have $v_1 - v_2 = 10$.

At the reference node, we write a KCL equation: $\frac{v_1}{5} + \frac{v_2}{10} = 1$.

Solving, we find $v_1 = 6.667$ and $v_2 = -3.333$.

Then, writing KCL at node 1, we have $i_s = \frac{v_2 - v_1}{5} - \frac{v_1}{5} = -3.333$ A.

P2.53 Writing KCL equations at nodes 1, 2, and 3, we have

$$\frac{v_1}{R_3} + \frac{v_1 - v_2}{R_4} + I_s = 0$$

$$\frac{v_2 - v_1}{R_4} + \frac{v_2 - v_3}{R_6} + \frac{v_2}{R_5} = 0$$

$$\frac{v_3}{R_1 + R_2} + \frac{v_3 - v_2}{R_6} = I_s$$

In standard form, we have:

$$0.15v_1 - 0.10v_2 = -5$$

$$-0.10v_1 + 0.475v_2 - 0.25v_3 = 0$$

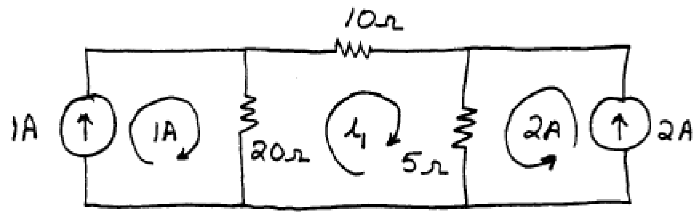
$$-0.25v_2 + 0.30v_3 = 5$$

Solving using Matlab, we have

```
G = [ 0.15 -0.10 0; -0.10 0.475 -0.25; 0 -0.25 0.30]
I = [-5; 0; 5]
V = G\I
```

$v_1 = -30.56$ V $\quad v_2 = 4.167$ V $\quad v_3 = 20.14$ V

P2.67* Because of the current sources, two of the mesh currents are known.



Writing a KVL equation around the middle loop we have

$$20(i_1 - 1) + 10i_1 + 5(i_1 + 2) = 0$$

Solving, we find $i_1 = 0.2857$ A.

P2.68 Writing KVL equations around each mesh, we have

$$5i_1 + 7(i_1 - i_3) + 31 = 0$$
$$11(i_2 - i_3) + 3i_2 - 31 = 0$$
$$i_3 + 11(i_3 - i_2) + 7(i_3 - i_1) = 0$$

Putting the equations into standard from, we have

$$12i_1 - 7i_3 = -31$$
$$14i_2 - 11i_3 = 31$$
$$-7i_1 - 11i_2 + 19i_3 = 0$$

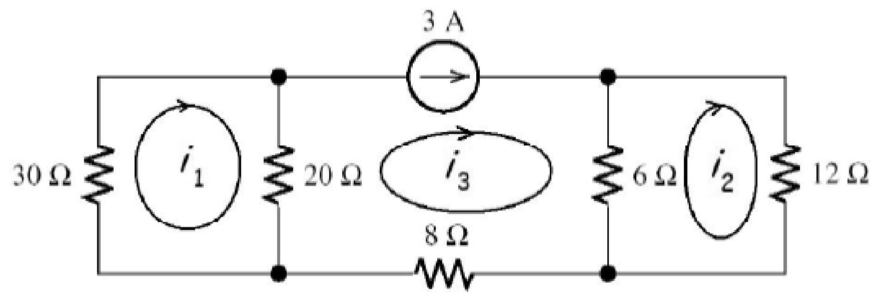
Using Matlab to solve, we have

```
>> R = [12 0 -7; 0 14 -11; -7 -11 19];
>> V = [-31; 31; 0];
>> I = R\V
I =
  -2.0000
   3.0000
   1.0000
```

Then, the power delivered by the source is $P = -31(i_1 - i_2) = 155$ W.

P2.71 First, we select the mesh currents and then write three equations.

Mesh 1: $30i_1 + 20(i_1 - i_3) = 0$



Mesh 2: $12i_2 + 6(i_2 - i_3) = 0$

However by inspection, we have $i_3 = 3$. Solving, we obtain $i_1 = 1.2$ A and $i_2 = 1.0$ A.