Problem 3.1  Apply nodal analysis to find the node voltage $V$ in the circuit of Fig. P3.1. Use the information to determine the current $I$.

![Circuit for Problem 3.1](image)

**Figure P3.1:** Circuit for Problem 3.1.

Solution: Application of KCL at node $V$ gives:

\[
\frac{V - 16}{2} + \frac{V - 12}{2 + 4} = 0
\]

\[
V \left( \frac{1}{2} + \frac{1}{3} + \frac{1}{6} \right) = \frac{16}{2} + \frac{12}{6}
\]

\[
V = 8 + 2 = 10 \text{ V}.
\]

The current $I$ is related to $V$ by

\[
I = -\frac{(V - 16)}{2} = -\frac{(10 - 16)}{2} = 3 \text{ A}.
\]
Problem 3.11  Determine the power supplied by the independent voltage source in the circuit of Fig. P3.11.

Solution: Application of KVL around the outside-perimeter loop gives

\[-12 + V_x + 2V_x = 0.\]

Hence,

\[V_x = 4 \text{ V}.\]

The current \(I\) entering the \(+\) terminal of the 12-V source is

\[I = -\frac{V_x}{2} = -\frac{4}{2} = -2 \text{ A},\]

and

\[P = VI = 12 \times (-2) = -24 \text{ W}.\]