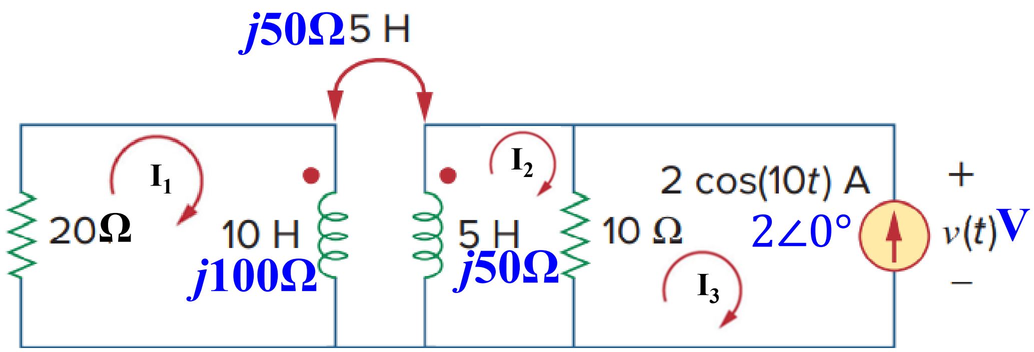
Problem 13.8 P597

Find $v(t)$ for the circuit in Fig. 13.77.



Solution:

$$(20 + j100)\mathbf{I_1} - j50\mathbf{I_2} = 0$$

$$-j50\mathbf{I_1} + (10 + j50)\mathbf{I_2} - 10\mathbf{I_3} = 0 \quad \Rightarrow \quad \mathbf{I_2} = 0.67\angle 120°$$

$$\mathbf{I_3} = -2\angle 0°$$

So: $\mathbf{V} = 10\ (\mathbf{I_2} - \mathbf{I_3}) = 17.6\angle 19°\ \text{V}$

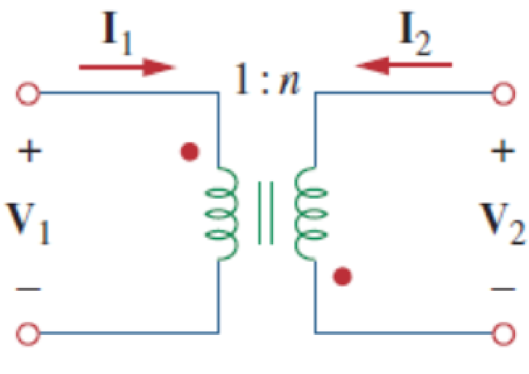
Then: $v(t) = 17.6\cos(10t + 19°)\ \text{V}$

Problem 13.36 P601

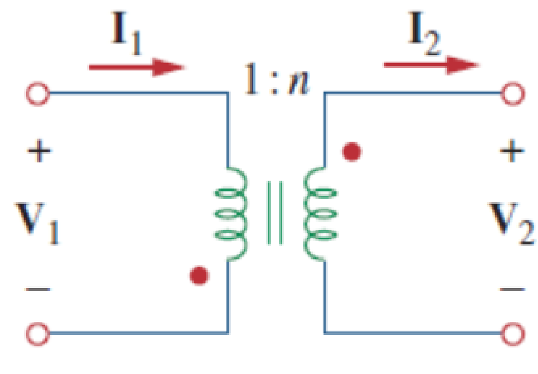
As done in Fig. 13.32, obtain the relationships between terminal voltages and currents for each of the ideal transformers in Fig. 13.105.

$$\frac{V_2}{V_1} = -n$$

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



(a)



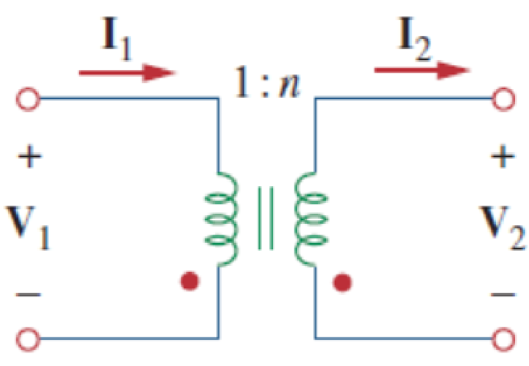
(b)

$$\frac{V_2}{V_1} = -n$$

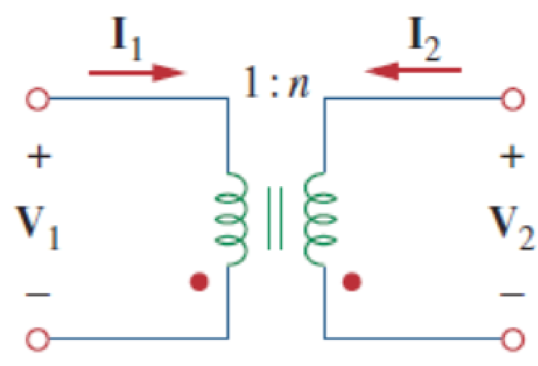
$$\frac{I_2}{I_1} = -\frac{1}{n}$$

$$\frac{V_2}{V_1} = n$$

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



(c)



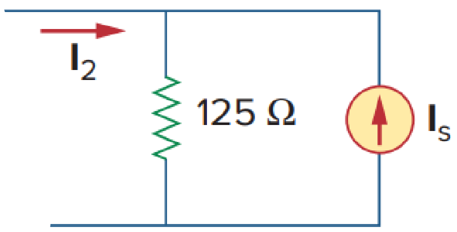
(d)

$$\frac{V_2}{V_1} = n$$

$$\frac{I_2}{I_1} = -\frac{1}{n}$$

Problem 13.41 P602

Given $I_2 = 2$ A, determine the value of I_s in Fig. 13.106.



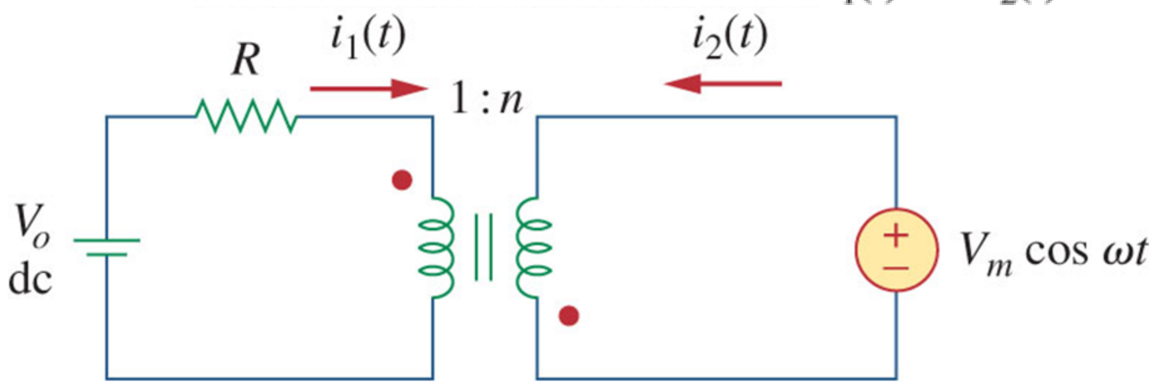
Solution:

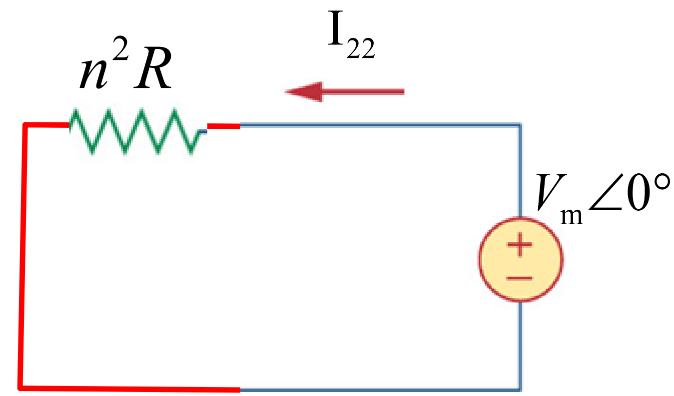
$$-10 \times 5^2 \mathbf{I_2} = 125(\mathbf{I_2} + \mathbf{I_s})$$

$$\Rightarrow \quad \mathbf{I_s} = -3\mathbf{I_2} = -6 \text{ A}$$

Problem 13.44 P602

In the ideal transformer circuit of Fig. 13.109, find $i_1(t)$ and $i_2(t)$.





Solution: When V_0 acts alone: $i_{11}(t) = \dfrac{V_0}{R}$, $\quad i_{21}(t) = 0$

When V_m coswt acts alone:

$$\mathrm{I}_{22} = \frac{V_\mathrm{m}\angle 0^\circ}{n^2 R} \qquad \frac{\mathrm{I}_{22}}{\mathrm{I}_{12}} = \frac{1}{n} \Rightarrow \mathrm{I}_{12} = n\mathrm{I}_{22} = \frac{V_m\angle 0^\circ}{nR}$$

So: $i_{12}(t) = \dfrac{V_\mathrm{m}}{nR}\cos wt,\ i_{22}(t) = \dfrac{V_\mathrm{m}}{n^2 R}\cos wt$

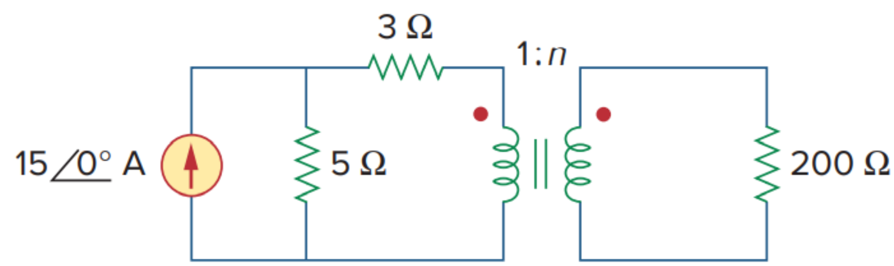
Then: $i_1(t) = i_{11}(t) + i_{12}(t) = \dfrac{V_0}{R} + \dfrac{V_\mathrm{m}}{nR}\cos wt,\ i_2(t) = i_{21}(t) + i_{22}(t) = \dfrac{V_\mathrm{m}}{n^2 R}\cos wt$

Problem 13.53 P603

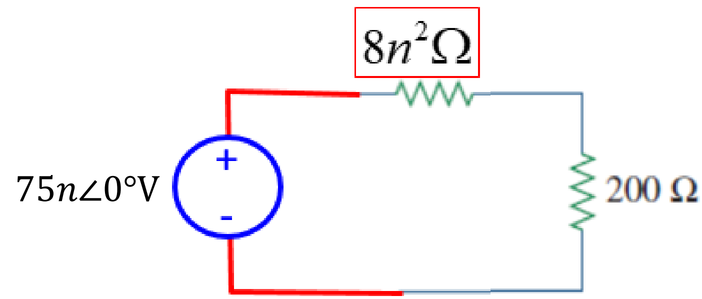
Refer to the network in Fig. 13.118.

(a) Find n for maximum power supplied to the 200-Ω load.

(b) Determine the power in the 200-Ω load if n = 10.



Solution:



(a) $8n^2 = 200 \quad \Rightarrow n = 5$

$$P_{max} = \frac{(75 \times 5)^2}{4 \times 200} = 176\ \text{W}$$

(b) $$P = \left(\frac{75n}{8n^2 + 200}\right)^2 \times 200$$

$$= \left(\frac{75 \times 10}{8 \times 10^2 + 200}\right)^2 \times 200$$

$$= 112.5\ \text{W}$$