Instantaneous and Average Power

Instantaneous power absorbed by a circuit element is

$$p(t) = v(t)\, i(t) \qquad \text{(unit:Watts)}$$

The average power absorbed between time T_1 and time T_2 is

$$P_{ave}[T_1,T_2] = 1/(T_2-T_1) \int_{T_1}^{T_2} p(t)\, dt$$

$$P_{ave} = \frac{1}{T} \int_{0}^{T} p(t)\, dt$$

where T is the period.

Figure 11.3

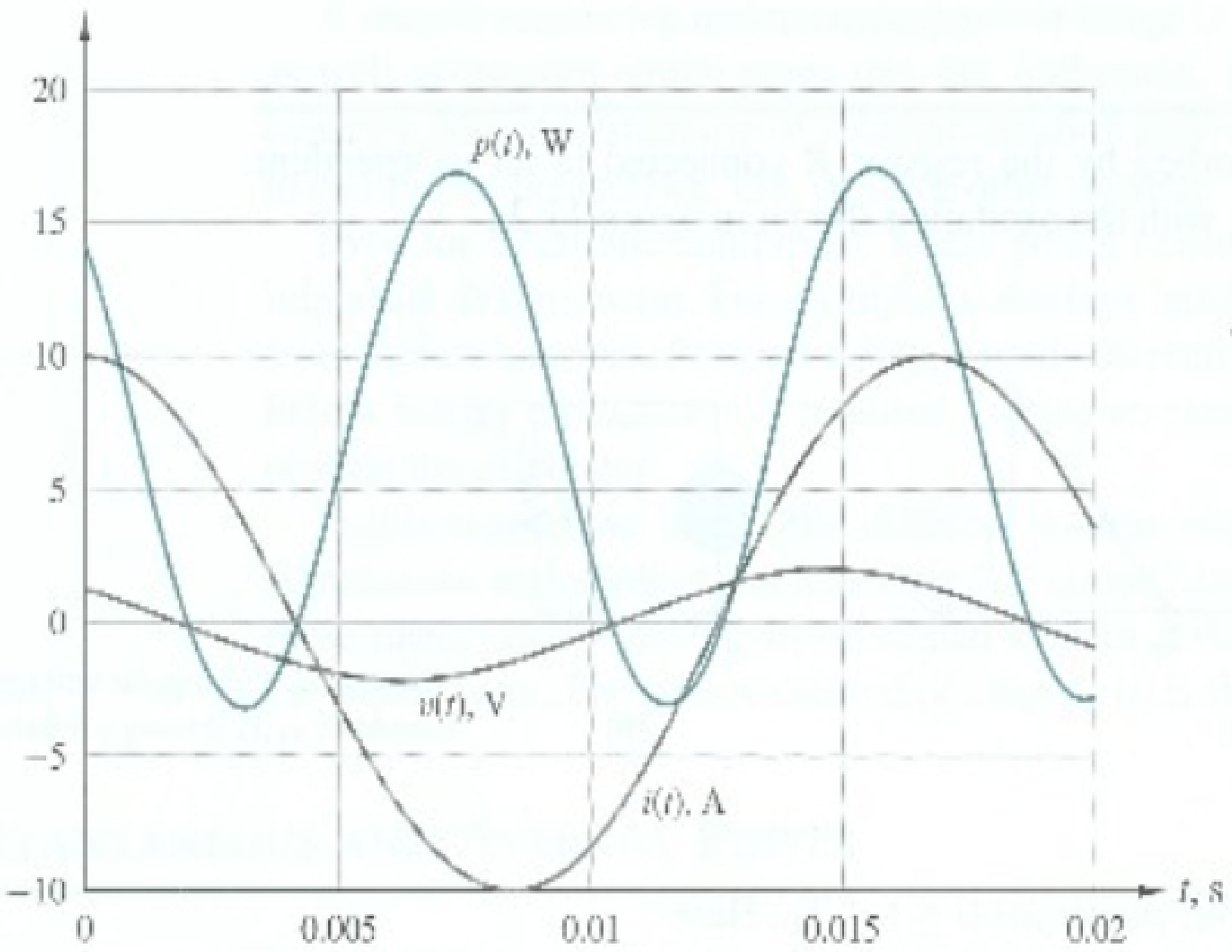
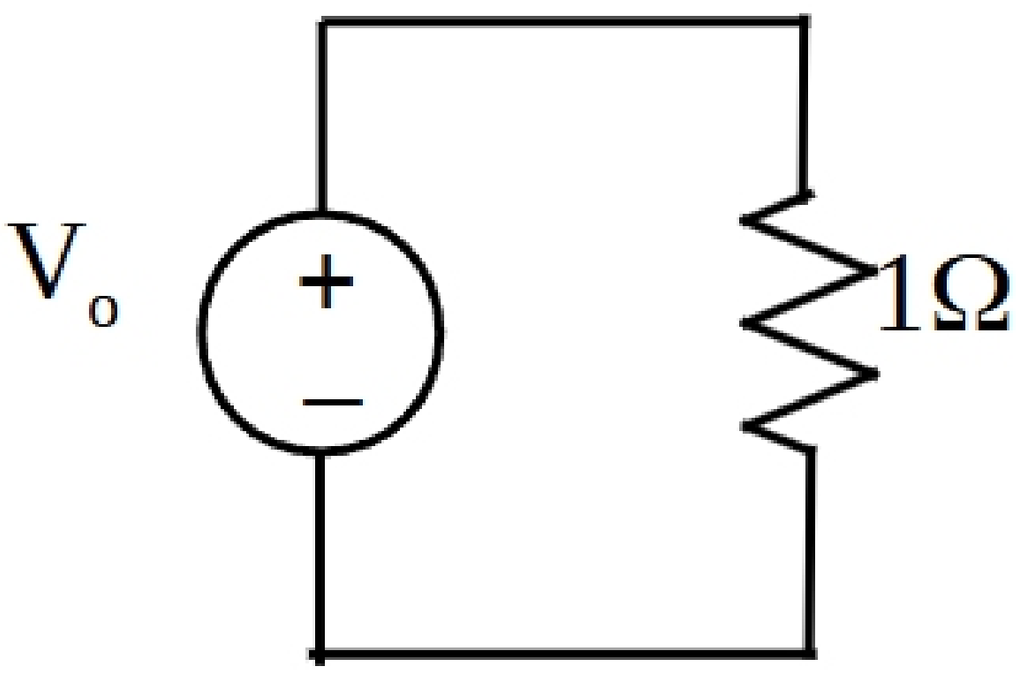


Figure 11.3 Plots of $i(t) = 10\cos(377t)$ A, $v(t) = 2\cos(377t + 45^\circ)$ V, and $p(t) = v(t)i(t)$.

Example: Show that the average power absorbed by a 1Ω resistor in the circuit below is $(V_0)^2$ over any time interval $[T_1, T_2]$.



Source voltage-time relationship