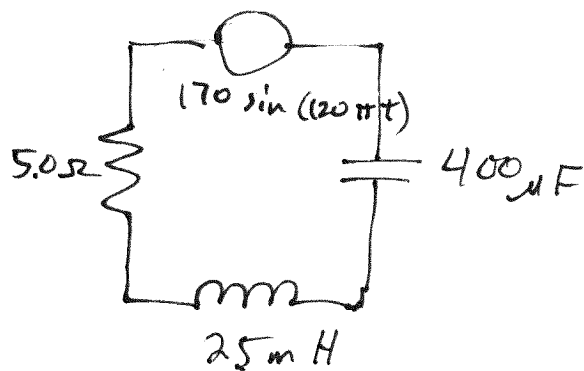


Ch. 15 Prob. 29



a) Find the total impedance

$$\omega = 120\pi \frac{\text{rad}}{\text{s}}$$

$$X_L = \omega L = (120\pi)(25 \times 10^{-3})$$

$$X_L = 9.42 \Omega$$

$$X_C = \frac{1}{\omega C} = \frac{1}{(120\pi)(400 \times 10^{-6})}$$

$$X_C = 6.63 \Omega$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{(5.0)^2 + (9.42 - 6.63)^2}$$

$$= \sqrt{(5.0)^2 + (2.79)^2} = \boxed{5.73 \Omega}$$

b) Find the phase shift

$$\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right) = \tan^{-1}\left(\frac{9.42 - 6.63}{5.0}\right) = 0.509 \text{ rad}$$

c) Write an expression for the current function

$$I_0 = \frac{V_0}{Z} = \frac{170 \text{ V}}{5.73 \Omega} = 29.7 \text{ A}$$

$$i(t) = (29.7 \text{ A}) \sin(120\pi t - 0.509)$$

Textbook solution is wrong should be a sine function with  $-0.51 \text{ rad}$