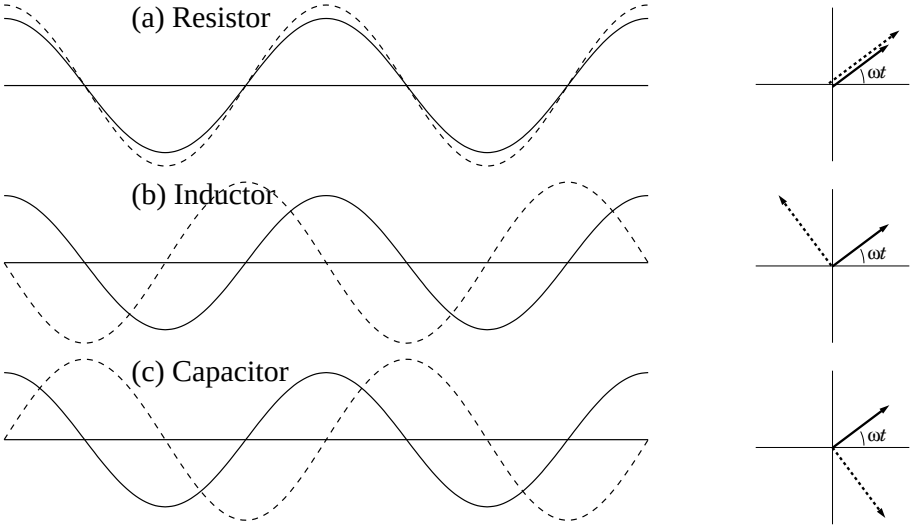
31-7. The requested graphs and phasor diagrams are in the textbook: for resistor: Fig. 31.7, for inductor: Fig. 31.8, and for capacitor: Fig. 31.9. I include my own version below. The solid line is for the current i; the dotted line for the voltage v. In words: for resistor v and i are in phase; for inductor v leads i by 90°; for capacitor v lags i by 90°. Please note that a naive interpretation of these graphs would (incorrectly) swap lead/lag in the above statements.



31-10. $V = X_L I$ and $X_L = \omega L = 2\pi f L$, so

$$f = \frac{V}{2\pi L I} = \frac{12}{2\pi \cdot 0.45 \times 10^{-3} \cdot 2.6 \times 10^{-3}} = 1.63 \times 10^6 \text{ Hz}$$

31-11. $V = X_C I$ and $X_C = 1/\omega C = 1/2\pi f C$, so

$$C = \frac{I}{V 2\pi f} = \frac{0.85}{170 \cdot 2\pi \cdot 60} = 1.3263 \times 10^{-5} = 13.3\ \mu\text{F}$$

31-21. (a) Clearly the maximum current occurs with the minimum Z which requires $X_C = X_L$, so $\omega = 1/\sqrt{LC}$.

$$f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{.4 \cdot 5 \times 10^{-6}}} = 113 \text{ Hz}$$

If $X_C = X_L$, $Z = R$ so

$$I = \frac{V}{R} = \frac{3}{200} = 15.0 \text{ mA}$$

(b)

$$\begin{aligned} X_C &= \frac{1}{\omega C} = \frac{1}{400 \cdot 5 \times 10^{-6}} = 500\ \Omega \\ X_L &= \omega L = 400 \cdot .4 = 160\ \Omega \\ R &= 200\ \Omega \\ Z &= \sqrt{R^2 + (X_C - X_L)^2} = 394\ \Omega \\ I &= \frac{V}{Z} = \frac{3}{394} = 7.61\ \text{mA} \end{aligned}$$

Since $X_C > X_L$ a phasor diagram shows $V_C > V_L$ so total voltage lags the current.

31-47. (a)

$$\begin{aligned} X_C &= \frac{1}{\omega C} = \frac{1}{2\pi \cdot 1250 \cdot 10 \times 10^{-6}} = 12.73\ \Omega \\ X_L &= \omega L = 2\pi \cdot 1250 \cdot 3.5 \times 10^{-3} = 27.49\ \Omega \\ R &= 50\ \Omega \\ Z &= \sqrt{R^2 + (X_C - X_L)^2} = 52.1\ \Omega \\ I &= \frac{V}{Z} = \frac{60}{52.1} = 1.15\ \text{A} \\ V_C &= X_C I = 12.73 \cdot 1.15 = 14.7\ \text{V} \\ V_L &= X_L I = 27.49 \cdot 1.15 = 31.6\ \text{V} \\ V_R &= RI = 57.5\ \text{V} \end{aligned}$$

(b) Everything except R changes:

$$\begin{aligned} X_C &\rightarrow \frac{1}{2} X_C = \frac{1}{2}\, 12.73 = 6.37\ \Omega \\ X_L &\rightarrow 2X_L = 2 \cdot 27.49 = 54.98\ \Omega \\ R &= 50\ \Omega \\ Z &= \sqrt{R^2 + (X_C - X_L)^2} = 69.74\ \Omega \\ I &= \frac{V}{Z} = \frac{60}{69.74} = 0.860\ \text{A} \\ V_C &= X_C I = 6.37 \cdot 0.860 = 5.48\ \text{V} \\ V_L &= X_L I = 54.98 \cdot 0.860 = 47.3\ \text{V} \\ V_R &= RI = 43.0\ \text{V} \end{aligned}$$