**31.46.**

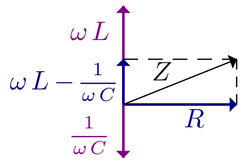
**(a)** $I = \dfrac{V_L}{X_L} = \dfrac{450\ \text{V}}{900\ \Omega} = 0.500\ \text{A}$. $V_R = IR = (0.500\ \text{A})(300\ \Omega) = 150\ \text{V}$.

**(b)** $V_C = IX_C = (0.500\ \text{A})(500\ \Omega) = 250\ \text{V}$.

**(c)** $V = \sqrt{V_R^2 + (V_L - V_C)^2} = \sqrt{(150\ \text{V})^2 + (450\ \text{V} - 250\ \text{V})^2} = 250\ \text{V}$.

**(d)** $P_{\text{av}} = I_{\text{rms}}^2 R = \dfrac{1}{2} I^2 R = \dfrac{1}{2}\dfrac{V_R^2}{R} = \dfrac{1}{2}\dfrac{(150\ \text{V})^2}{300\ \Omega} = 37.5\ \text{W}$.

**52.**




The impedance is

$$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$I = \frac{V_s}{Z}, \quad V_{\text{out}} = V_C = I X_C = \frac{V_s}{\omega C Z}$$

(In this problem we care only about amplitudes, not phase shifts.)

$$\frac{V_{\text{out}}}{V_s} = \frac{1}{\omega C Z} = \frac{1}{\omega C \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}} = \frac{1}{\sqrt{R^2 C^2 \omega^2 + (L C \omega^2 - 1)^2}}$$

When $\omega$ is small (meaning $\omega \ll \frac{1}{RC}$ and $\omega \ll \frac{1}{\sqrt{LC}}$),

$$\frac{V_{\text{out}}}{V_s} \approx \frac{1}{\sqrt{0 + (0-1)^2}} = 1.$$

When $\omega$ is large,

$$\frac{V_{\text{out}}}{V_s} = \frac{1}{\sqrt{1 + (R^2 C^2 - 2 L C)\, \omega^2 + L^2 C^2 \omega^4}} \approx \frac{1}{\sqrt{L^2 C^2 \omega^4}} = \frac{1}{L C \omega^2}.$$