

31. (a) The current amplitude I is given by $I = V_L/X_L$, where $X_L = \omega_d L = 2\pi f_d L$. Since the circuit contains only the inductor and a sinusoidal generator, $V_L = \mathcal{E}_m$. Therefore,

$$I = \frac{V_L}{X_L} = \frac{\mathcal{E}_m}{2\pi f_d L} = \frac{30.0 \text{ V}}{2\pi(1.00 \times 10^3 \text{ Hz})(50.0 \times 10^{-3} \text{ H})} = 0.0955 \text{ A} .$$

- (b) The frequency is now eight times larger than in part (a), so the inductive reactance X_L is eight times larger and the current is one-eighth as much. The current is now $(0.0955 \text{ A})/8 = 0.0119 \text{ A}$.