**34.43.** **Model:** Use Equation 34.31 for the definition of the displacement current.
**Solve:** The current in a conductor arises from the electric field $E$ in the conductor. From Equation 28.18,

$$J = \frac{I}{A} = \sigma E \Rightarrow \frac{dI}{dt} = \frac{d}{dt}(\sigma EA) = \sigma \frac{d}{dt}(EA) = \sigma \frac{d}{dt}\Phi_e = \sigma \frac{I_{\text{disp}}}{\varepsilon_0}$$

where $\Phi_e = EA$ is the electric flux through the wire and, by definition, $I_{\text{disp}} = \varepsilon_0 \, d\Phi_e / dt$. Thus $I_{\text{disp}} = (\varepsilon_0 / \sigma) dI / dt$.
**(b)** Using the value for the conductivity of copper wire from Table 28.2,

$$I_{\text{disp}} = \frac{\varepsilon_0}{\sigma}\frac{dI}{dt} = \frac{8.85 \times 10^{-12} \text{ C}^2 / \text{N m}^2}{6.0 \times 10^7 \Omega^{-1}\text{m}^{-1}}\left(1.0 \times 10^6 \text{ A / s}\right) = 1.48 \times 10^{-13} \text{ A}$$