36. (a) The circuit consists of one generator across one capacitor; therefore, $\mathcal{E}_m = V_C$. Consequently, the current amplitude is

$$I = \frac{\mathcal{E}_m}{X_C} = \omega C \mathcal{E}_m = (377\,\text{rad/s})(4.15 \times 10^{-6}\,\text{F})(25.0\,\text{V}) = 3.91 \times 10^{-2}\,\text{A} .$$

(b) When the current is at a maximum, the charge on the capacitor is changing at its largest rate. This happens not when it is fully charged ($\pm q_{\text{max}}$), but rather as it passes through the (momentary) states of being uncharged ($q = 0$). Since $q = CV$, then the voltage across the capacitor (and at the generator, by the loop rule) is zero when the current is at a maximum. Stated more precisely, the time-dependent emf $\mathcal{E}(t)$ and current $i(t)$ have a $\phi = -90°$ phase relation, implying $\mathcal{E}(t) = 0$ when $i(t) = I$. The fact that $\phi = -90° = -\pi/2$ rad is used in part (c).

(c) Consider Eq. 32-28 with $\mathcal{E} = -\frac{1}{2}\mathcal{E}_m$. In order to satisfy this equation, we require $\sin(\omega_d t) = -1/2$. Now we note that the problem states that $\mathcal{E}$ is increasing *in magnitude*, which (since it is already negative) means that it is becoming more negative. Thus, differentiating Eq. 32-28 with respect to time (and demanding the result be negative) we must also require $\cos(\omega_d t) < 0$. These conditions imply that ωt must equal $(2n\pi - 5\pi/6)$ [$n =$ integer]. Consequently, Eq. 33-29 yields (for all values of n)

$$i = I \sin\left(2n\pi - \frac{5\pi}{6} + \frac{\pi}{2}\right) = \left(3.91 \times 10^{-3}\,\text{A}\right)\left(-\frac{\sqrt{3}}{2}\right) = -3.38 \times 10^{-2}\ \text{A} .$$