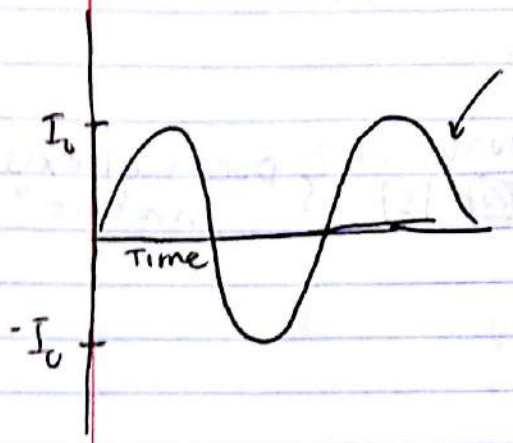
25-7 Alternating Current



#oscillations/sec.

$$V = V_0 \sin(2\pi f t) = V_0 \sin(\omega t)$$

(V_0: peak voltage; $2\pi f$: ω)

Ohm's Law also applies!

$$I = \frac{V}{R} = \boxed{\frac{V_0}{R}} \sin(\omega t)$$

$\frac{V_0}{R}$: Peak current

Power

$$P = I^2 R = I_0^2 R \sin^2(\omega t)$$ ← always positive!

$$\bar{P} \text{ (avg Power)} = \frac{1}{2} I_0^2 R, \ \frac{1}{2} \frac{V_0^2}{R}$$

The avg. value of the square of I or V is important, because $\bar{I}^2 = \frac{1}{2} I_0^2$ and $\bar{V}^2 = \frac{1}{2} V_0^2$. The root of these values is the rms (or effective) values of current/voltage:

$$V_{rms} = \frac{V_0}{\sqrt{2}} = 0.707 V_0 \qquad I_{rms} = \frac{I_0}{\sqrt{2}} = 0.707 I_0$$

Helpful because

$$\bar{P} = V_{rms} I_{rms} \qquad \bar{P} = \frac{1}{2} I_0^2 R = I_{rms}^2 R$$

$$\bar{P} = \frac{1}{2} \frac{V_0^2}{R} = \frac{V_{rms}^2}{R}$$