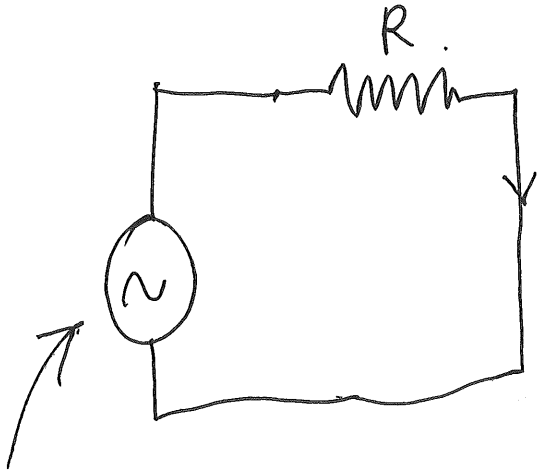


$I = \frac{V_{max}}{R} \sin \omega t$.

$V = V_{max} \sin \omega t$

$P = VI = V_{max} \sin \omega t \cdot \frac{V_{max}}{R} \sin \omega t$

$= \frac{V_{max}^2}{R} \sin^2 \omega t$.

Power is a function of time.

average power over one period

$$\langle P \rangle = \frac{\int_0^T \frac{V_{max}^2}{R} \sin^2 \omega t \, dt}{T}$$

$$= \frac{\frac{V_{max}^2}{R} \int_0^T \sin^2 \omega t \, dt}{T}$$

$$= \frac{V_{max}^2}{RT} \cdot \int_0^T \frac{1 - \cos 2\omega t}{2} \, dt$$

$$= \frac{V_{max}^2}{RT} \left[\frac{1}{2} T - \frac{1}{4\omega} \sin 2\omega t \right]_0^T = \frac{1}{2} \frac{V_{max}^2}{R}$$

($\sin 2\omega t$ evaluates to 0 at both limits)

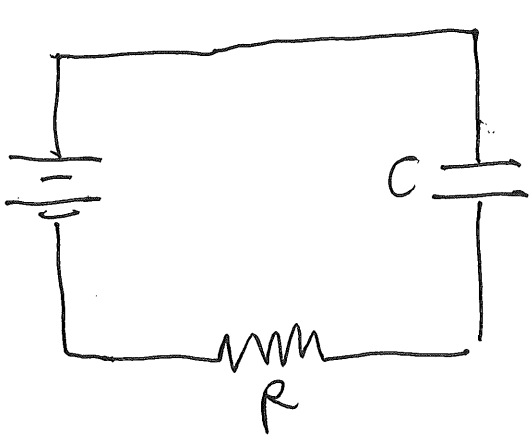
$$\langle P \rangle = \frac{1}{2}\frac{V_{max}^2}{R} = \frac{V_{rms}^2}{R}$$

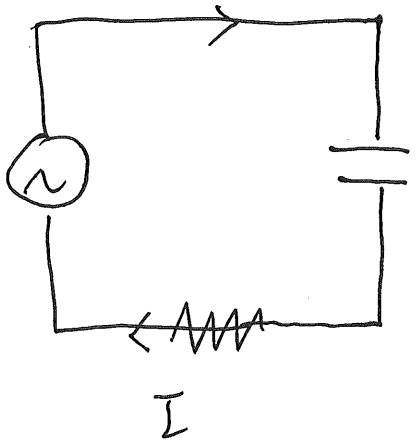
$$\frac{1}{2}V_{max}^2 = V_{rms}^2$$

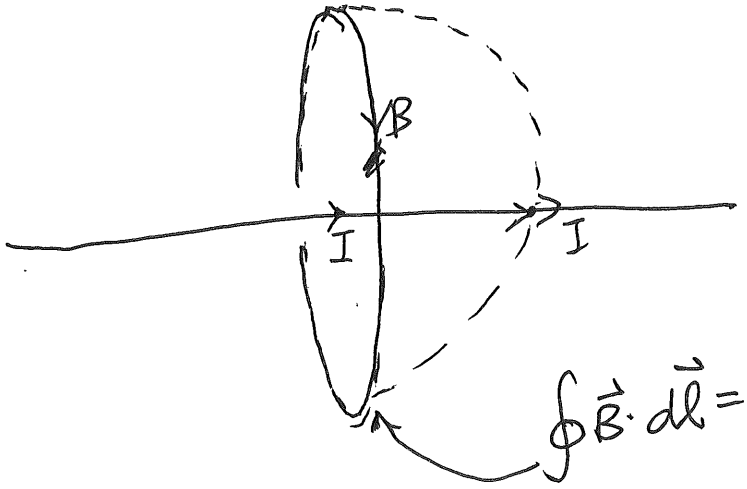
$$V_{rms} = \frac{V_{max}}{\sqrt{2}} = 0.707\,V_{max}.$$

V_{rms} ↑ root mean square.

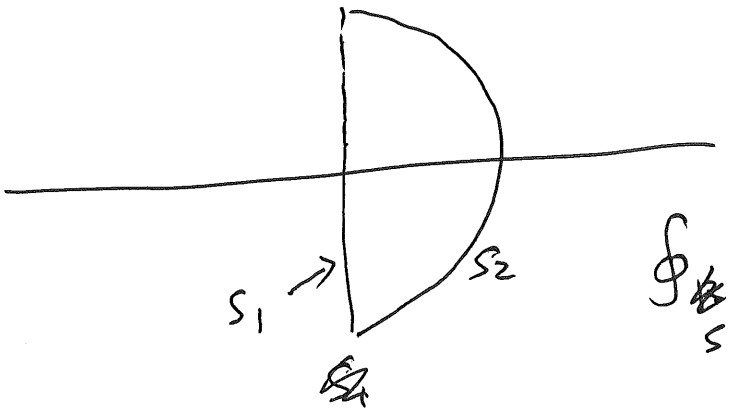
≡ square root of the mean of the square.





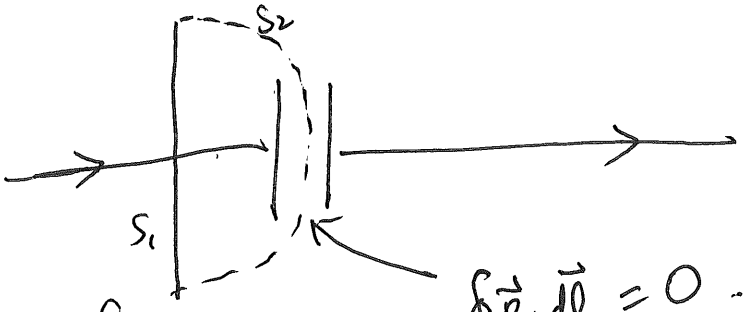


$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$$



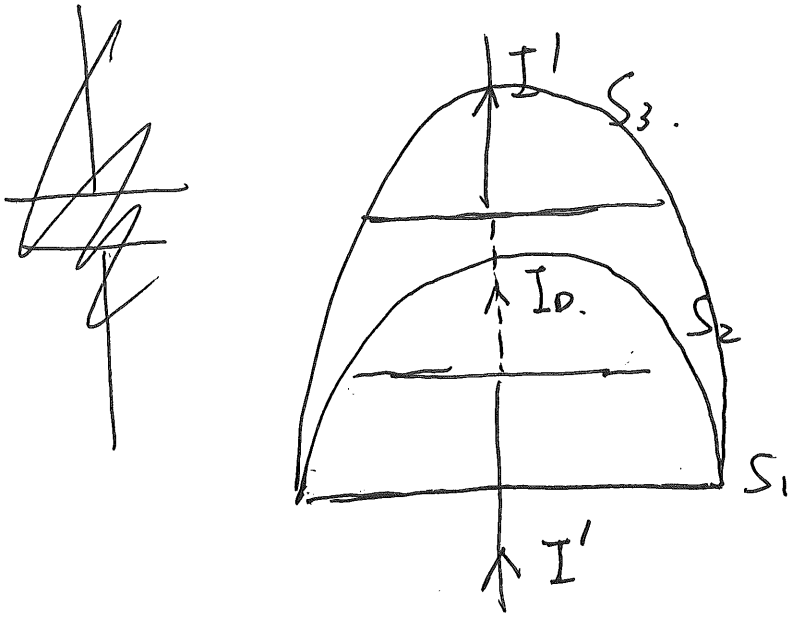
$$\oint_{S_1} \vec{B} \cdot d\vec{l} = \mu_0 I$$

$$\oint_{S_2} \vec{B} \cdot d\vec{l} = \mu_0 I.$$



$$\oint_{S_1} \vec{B} \cdot d\vec{l} = \mu_0 I. \qquad \oint_{S_2} \vec{B} \cdot d\vec{l} = 0.$$

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 (I + I_d).$$



For S_1: $I = I'$. $I_D = 0$.

S_2: $I = 0$, $I_d = I'$.

S_3: $I = I'$. $I_D = 0$.

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 (I + 0).$$

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \left(I + \varepsilon_0 \frac{d\Phi_E}{dt}\right).$$