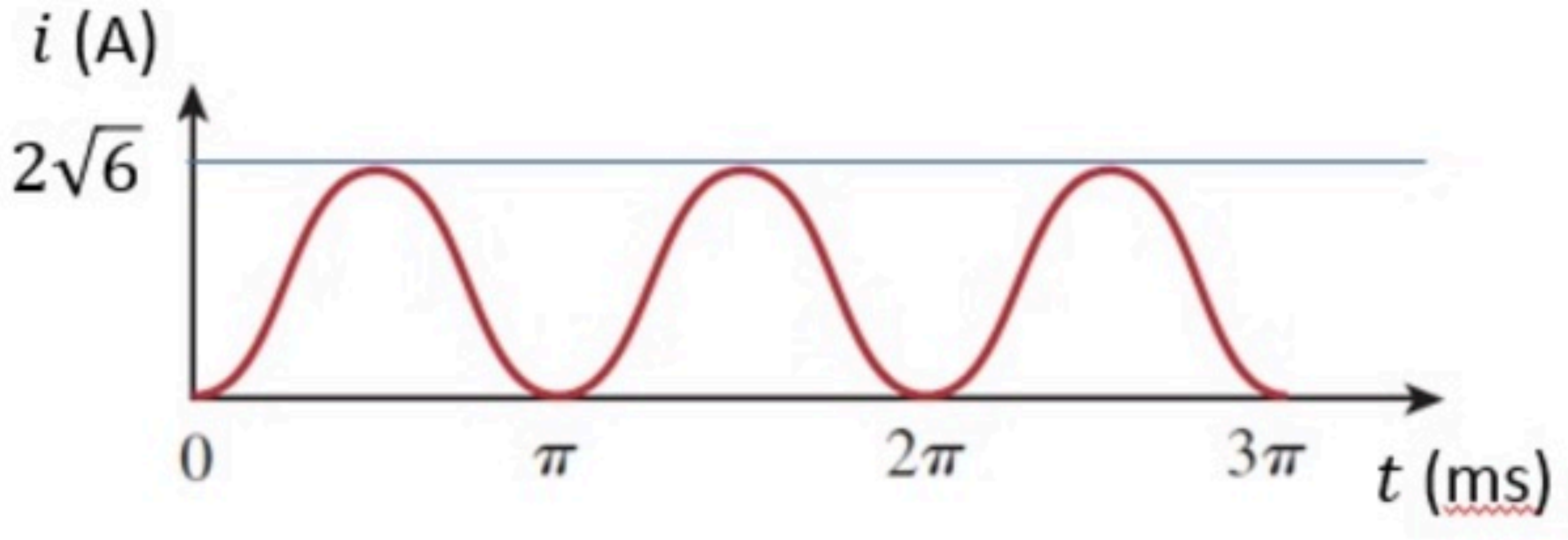
PP AC power 005

Unlimited Attempts.

Find I_{rms} for this waveform (it is a sine wave that has an offset, i.e., it is shifted up).



Given Variables:

. : . .

Calculate the following:

Irms (A) :

3

> Hint: Utilize the fact that you know the Irms for a sine wave.

$$i = \sqrt{6} - \sqrt{6}\cos(\omega t) = \sqrt{6}\,(1 - \cos(\omega t))$$

$$i^2 = 6\,(1 - \cos(\omega t))^2$$

$$A = \frac{1}{T}\int_0^T i^2\,dt = \frac{6}{T}\int_0^T \left[1 - 2\cos(\omega t) + \cos^2(\omega t)\right] dt$$

$$= \frac{6}{T}\int_0^T dt - \frac{12}{T}\int_0^T \cos(\omega t)\,dt + \frac{6}{T}\int_0^T \cos^2(\omega t)\,dt$$

$$= \frac{6}{T}\cdot T - \frac{12}{T}\cdot 0 + 6\cdot\frac{1}{2}$$

$\hookrightarrow$ WE KNOW FOR A COS

$$I_{RMS} = \frac{I_M}{\sqrt{2}} \Rightarrow I_{RMS}^2 = \frac{I_M^2}{2}$$

$$I_{RMS}^2 = \frac{I_M^2}{T}\int_0^T \cos^2(\omega t)\,dt$$

$$\Rightarrow \frac{1}{T}\int_0^T \cos^2(\omega t)\,dt = \frac{1}{2}$$

$$A = 6 + \frac{6}{2} = 9$$

$$I_{RMS} = \sqrt{A} \Rightarrow \boxed{I_{RMS} = 3\,A}$$