Answer on Question #48738 – Math – Calculus

For a voltage V=200sin200pi(t), find the root-mean-square voltage for one period.

Solution.

$\boldsymbol{V = V_0 sin 200\pi t}$, **where** $\boldsymbol{V_0 = 200.}$

$\boldsymbol{V_{RMS} = V_0\sqrt{\frac{1}{T}\int_0^T sin^2(\omega t)dt}}$,

where $\boldsymbol{\omega}$ **– angular frequency,** $\boldsymbol{T}$ **– period, (**$\boldsymbol{\omega = \frac{2\pi}{T}}$).

So, $\boldsymbol{V_{RMS} = V_0\sqrt{\frac{1}{T}\int_0^T \frac{1-cos(2\omega t)}{2}dt} = V_0\sqrt{\frac{1}{T}\left[\frac{t}{2} - \frac{sin(2\omega t)}{4\omega}\right]|_{t=0}^{T}} = V_0\sqrt{\frac{1}{T}\frac{T}{2}} = \frac{V_0}{\sqrt{2}}}$

In our case: $\boldsymbol{V_{RMS} = \frac{200}{\sqrt{2}} = 100\sqrt{2} \approx 141.42}$.