

Answer on Question #58157 – Math – Calculus

Question

The electric current i flowing in a device varies with time t . The equation linking the two variables is as follows

$$i = 2\sin(5t)$$

The area under the graph represents the charge q that has passed over any given time interval

Calculate the area and hence the charge by integrating the equation between $t=t_1$ and $t=t_2$
 $t_1=0.4$ and $t_2=0.5$

Solution

Since $2 \sin(5t) > 0$, where $0.4 < t < 0.5$, then

$$\begin{aligned} q &= \int_{0.4}^{0.5} 2 \sin(5t) dt = \frac{2}{5} \int_{0.4}^{0.5} \sin(5t) d(5t) = -\frac{2}{5} \cos(5t) \Big|_{0.4}^{0.5} = \\ &= -\frac{2}{5} (\cos(5 * 0.5) - \cos(5 * 0.4)) = -\frac{2}{5} (\cos(2.5) - \cos(2)) \approx 0.154 \end{aligned}$$

Answer: 0.154.