

**Answer on Question #45992, Physics, Electromagnetism**

The current  $I$  in a conductor as a function of time  $t$  is given as  $I(t)=5t^2-3t+10$  where current is in amperes  $A$  and  $t$  is in seconds  $s$ . What quantity of charge moves across a section through the conductor during the interval  $t=2s$  to  $t=5s$ ?

By the definition of current:

$$I = \frac{dq}{dt}$$

From this equation we can find charge:

$$dq = Idt$$

$$\begin{aligned} q &= \int_{2s}^{5s} Idt = \int_2^5 (5t^2 - 3t + 10)dt = \left(\frac{5}{3}t^3 - \frac{3}{2}t^2 + 10t\right) \Big|_2^5 = \\ &= \frac{5}{3}(5)^3 - \frac{3}{2}(5)^2 + 10 \cdot 5 - \frac{5}{3}(2)^3 + \frac{3}{2}(2)^2 - 10 \cdot 2 = 193.5C \end{aligned}$$

**Answer:** charge moves across a section through the conductor:  $q = 193.5C$