

Problem 1.7

The charge flowing in a wire is plotted in Fig. 1.24. Sketch the corresponding current.

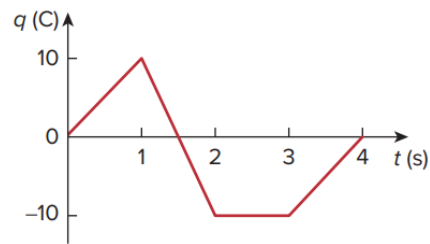


Figure 1.24

For Prob. 1.7.

Solution

Current and charge are related by

$$i(t) = \frac{dq}{dt},$$

so the current is the slope of the charge-versus-time graph.

$$\text{For } 0 < t < 1 \text{ s:} \quad i(t) = \frac{\text{rise}}{\text{run}} = \frac{(10 - 0) \text{ C}}{(1 - 0) \text{ s}} = 10 \frac{\text{C}}{\text{s}} = 10 \text{ A}$$

$$\text{For } 1 < t < 2 \text{ s:} \quad i(t) = \frac{\text{rise}}{\text{run}} = \frac{(-10 - 10) \text{ C}}{(2 - 1) \text{ s}} = -20 \frac{\text{C}}{\text{s}} = -20 \text{ A}$$

$$\text{For } 2 < t < 3 \text{ s:} \quad i(t) = \frac{\text{rise}}{\text{run}} = \frac{(-10 - (-10)) \text{ C}}{(3 - 2) \text{ s}} = 0$$

$$\text{For } 3 < t < 4 \text{ s:} \quad i(t) = \frac{\text{rise}}{\text{run}} = \frac{(0 - (-10)) \text{ C}}{(4 - 3) \text{ s}} = 10 \frac{\text{C}}{\text{s}} = 10 \text{ A}$$

