Problem 1.6

The charge entering a certain element is shown in Fig. 1.23. Find the current at:

(a) $t = 1$ ms (b) $t = 6$ ms (c) $t = 10$ ms

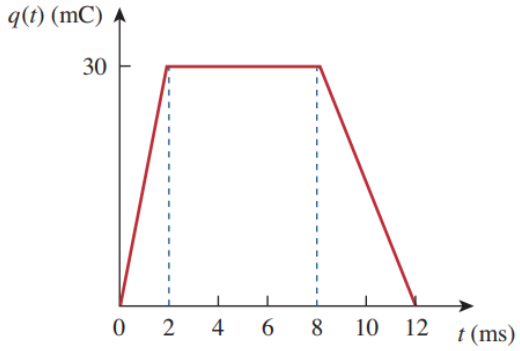

Figure 1.23
For Prob. 1.6.

Solution

Current and charge are related by

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

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

(a) At $t = 1$ ms: $$i(t) = \frac{\text{rise}}{\text{run}} = \frac{(30-0)\text{ mC}}{(2-0)\text{ ms}} = 15\,\frac{\text{C}}{\text{s}} = 15\text{ A}$$

(b) At $t = 6$ ms: $$i(t) = \frac{\text{rise}}{\text{run}} = \frac{(30-30)\text{ mC}}{(8-2)\text{ ms}} = 0$$

(c) At $t = 10$ ms: $$i(t) = \frac{\text{rise}}{\text{run}} = \frac{(0-30)\text{ mC}}{(12-8)\text{ ms}} = -7.5\,\frac{\text{C}}{\text{s}} = -7.5\text{ A}$$