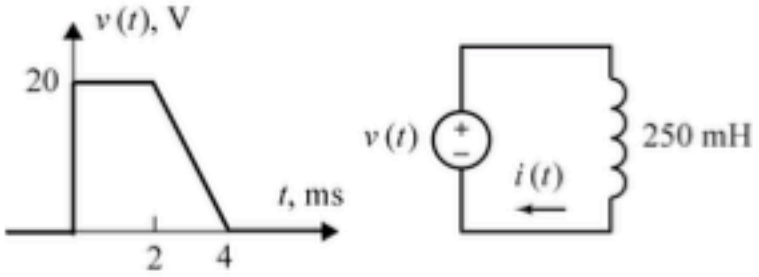
Problem 1

At time $t = 0$, the current in the inductor shown in Figure P7.5-21 is $i(0) = 45$ mA. Determine the values of the inductor current at times 1 ms, 4 ms and 6 ms.



Solution:

$$i(t) = i(0) + \frac{1}{L}\int_0^t v(\tau)\,d\tau = i(0) + \frac{\text{"area under the curve"}}{L} = 0.045 + \frac{\text{"area under the curve"}}{0.250}$$

$$i(0.001) = 0.045 + \frac{20(0.001)}{0.250} = 0.125 \text{ A} = 125 \text{ mA},$$

$$i(0.004) = 0.045 + \frac{20(0.002) + \frac{1}{2}20(0.002)}{0.250} = 0.285 \text{ A} = 285 \text{ mA}$$

$$i(0.006) = 0.045 + \frac{20(0.002) + \frac{1}{2}20(0.002) + 0}{0.250} = 0.285 \text{ A} = 285 \text{ mA}$$