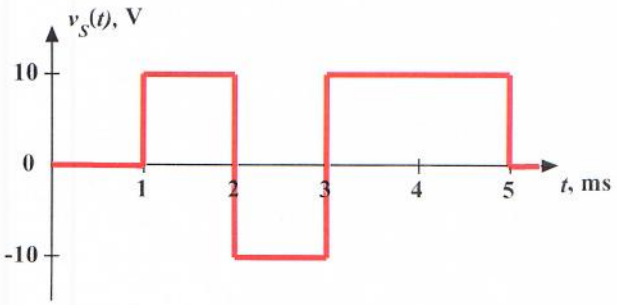
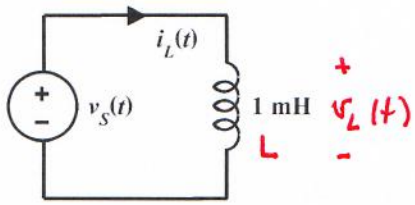
EE/EET 2240

Homework Problem #043





The independent voltage source is described by the plot shown. Given $i_L(0) = 0\,\text{A}$, accurately sketch the waveform for the current $i_L(t)$ for $0 < t$.

$$i_L(t) = \frac{1}{L}\int_{-\infty}^{t} v_L(\tau)\,d\tau = \cancel{i_L(0)} + \frac{1}{L}\int_{0}^{t} v_L(\tau)\,d\tau = 1000\int_{0}^{t} v_S(\tau)\,d\tau$$

$$= \begin{cases} 1000\int_0^{\tau} 0\,d\tau = 0 & : \quad 0 < t < 1\text{ms} \\ 0 + 1000\int_{0.001}^{t} (10)\,d\tau = 10000(t - 0.001) & \\ \quad = 10000t - 10 \ \text{A} & : \quad 1\text{ms} < t < 2\text{ms} \\ 10 + 1000\int_{0.002}^{t} (-10)\,d\tau = 10 - 10000(t - 0.002) & \\ \quad = 30 - 10000t \ \text{A} & : \quad 2\text{ms} < t < 3\text{ms} \\ 0 + 1000\int_{0.003}^{t} (10)\,d\tau = 10000(t - 0.003) & \\ \quad = 10000t - 30 \ \text{A} & : \quad 3\text{ms} < t < 5\text{ms} \\ 20\ \text{A} & : \quad 5\text{ms} < t \end{cases}$$