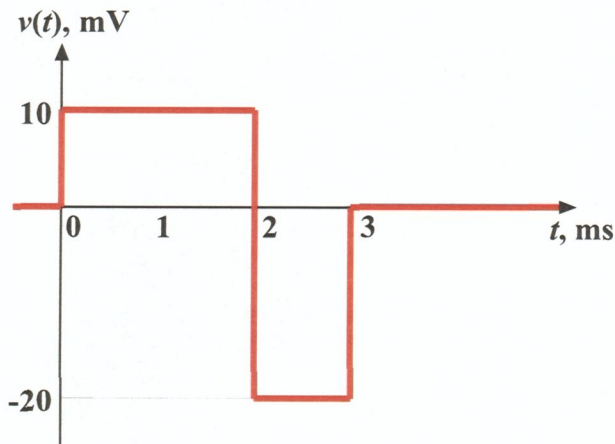# Problem #05

The waveform for the voltage across a 20 mH inductor is shown. Determine, and accurately sketch, the waveform for the inductor current if $v(t) = 0$ for $t < 0$.

$$i(t) = \frac{1}{L}\int_{-\infty}^{t} v(\tau)\,d\tau = \frac{1}{L}\int_{-\infty}^{0} v(\tau)\,d\tau + \frac{1}{L}\int_{0}^{t} v(\tau)\,d\tau = 50\int_{0}^{t} v(\tau)\,d\tau$$

For $0 < t < 2\,ms$: $\qquad v(t) = 10\,mV$

$$i(t) = 50\int_{0}^{t}(10\times10^{-3})\,d\tau = 0.5t \quad A$$

For $2\,ms < t < 3\,ms$: $\qquad v(t) = -20\,mV$

$$i(t) = 0.5(2\times10^{-3}) + 50\int_{2ms}^{t}(-20\times10^{-3})\,d\tau$$

$$= 0.001 - 1(t - 2ms) = 0.003 - t \quad A$$

For $3\,ms < t$: $\qquad v(t) = 0$

$$i(t) = 0.003 - 0.003 = 0 \quad A$$