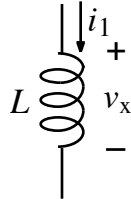


Ex: In (a)-(c), the current $i_L(t)$ flowing into a 0.5 mH inductor is listed. Find the voltage, $v_L(t)$, across the inductor in each case as a function of time:



- a) $i_L(t) = 5 \text{ mA}$
- b) $i_L(t) = 5t \text{ mA/s}$
- c) $i_L(t) = 5 \sin(2\pi \cdot 100t) \text{ mA}$

SOL'N: We use the defining equation for an inductor in each case:

$$v_L = L \frac{di_L}{dt}$$

a)

$$v_L = L \frac{d}{dt} 5 \text{ mA} = L \cdot 0 \text{ A/s} = 0 \text{ V}$$

b)

$$v_L = L \frac{d}{dt} 5t \text{ mA/s} = 0.5 \text{ mH} \cdot 5 \text{ mA/s} = 2.5 \text{ } \mu\text{V}$$

c)

$$v_L = L \frac{d}{dt} 5 \sin(2\pi \cdot 100t) \text{ mA} = 0.5 \text{ mH} \cdot 5 \cos(2\pi \cdot 100t) 200\pi \text{ mA/s}$$

$$v_L = \frac{\pi}{2} \cos(2\pi \cdot 100t) \text{ mV}$$