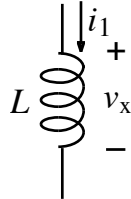


**Ex:** In (a)-(c), the current  $i_L(t)$  flowing into a 0.5 mH inductor is listed. Find the voltage,  $v_L(t)$ , across the inductor in each case as a function of time:



- 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)

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

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