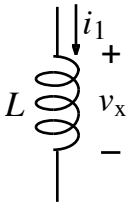
HOMEWORK #9 solution

Ex: In (a)-(c), the current $i_L(t)$ flowing into a 2 μH inductor is listed. Find the voltage, $v_L(t)$, across the inductor in each case as a function of time:



a) $i_L(t) = 3$ mA
b) $i_L(t) = 10t$ MA/s
c) $i_L(t) = 8\cos(2\pi \cdot 10\text{k} \cdot t)$ μA

Sol'n: We use the defining equation for an inductor in each case:

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

a)

$$v_L = L\frac{d}{dt}3\text{ mA} = L \cdot 0\text{ A/s} = 0\text{ V}$$

b)

$$v_L = L\frac{d}{dt}10t\text{ MA/s} = 2\text{ μH} \cdot 10\text{ MA/s} = 20\text{ V}$$

c)

$$v_L = L\frac{d}{dt}8\cos(2\pi \cdot 10\text{k} \cdot t)\text{ μA} = 2\text{ μH} \cdot (-8\sin(2\pi \cdot 10\text{k} \cdot t)20\text{k}\pi\text{ μA/s}$$

$$v_L = -320\pi \sin(2\pi \cdot 10\text{k} \cdot t)\text{ nV}$$