

Ch 14, Prob 39

$$L = 2.0 \text{ H}$$

$$I(t) = (2.0 \text{ A}) \sin(120\pi t)$$

Find the expression ~~of~~ for the induced emf.

$$\begin{aligned}\mathcal{E} &= -L \frac{dI}{dt} = -(2.0 \text{ H}) \frac{d}{dt} [(2.0 \text{ A}) \sin(120\pi t)] \\ &= -(2.0 \text{ H})(2.0 \text{ A})(120\pi) \cos(120\pi t) \\ &= -480\pi \cos(120\pi t)\end{aligned}$$

$$\boxed{\mathcal{E} = -(1508 \text{ V}) \cos(120\pi t)}$$

If the wave is shifted to the right by $\pi/2$,
then it becomes

$$\mathcal{E} = 480\pi \sin(120\pi t - \pi/2)$$

(Remember: from calculus $f(x+a)$ moves to the left as 'a' increases
 $f(x-a)$ moves to the right as 'a' increases)