

# Thursday Reading Assessment: Unit 4, AC waveforms

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## 1 Memory Bank

- $v(t) = v_0 \sin(2\pi ft - \phi)$  ... Standard AC waveform, with amplitude  $v_0$ , in volts, frequency  $f$ , in Hertz, time  $t$ , in seconds, and phase  $\phi$ , in radians.
- Note that the relative phase between the sine function and the cosine function is 90 degrees.

## 2 Properties of AC Waveforms

1. Consider the voltage waveform in Fig. 1. The voltages at points a, c, and e, are zero. Suppose that  $t_a = 1$  ms, and  $t_e = 3$  ms. (a) What is the period of the voltage? (b) What is the frequency of the voltage?
2. While the amplitude of the voltage at time  $t_a$  is zero, the amplitude of the current is maximized. (a) What is the relative phase between the two waveforms? (c) If two waveforms have a relative phase shift of 180 degrees, what happens when they are summed? *Hint: try creating an example.*
3. (a) If a signal has a frequency of 10 kHz, what is its period? (b) If the period of a signal is  $2 \mu\text{s}$ , what is the frequency? (c) If the period of  $2 \mu\text{s}$  is *doubled*, what is the frequency?

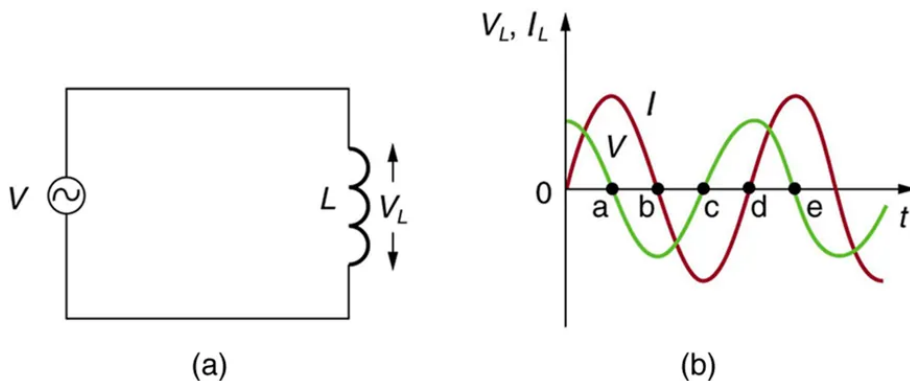


Figure 1: AC waveforms of voltage and current versus time.