Simple Harmonic Motion

An alternating current is described by each sinusoidal function, where c(t) is the current measured in amperes at t seconds. Find the amplitude, period, and frequency of each.

1) $c(t) = 30sin120\pi t$

2) $c(t) = 40cos250t$

3) $c(t) = 24sin(t + 4)$

4) $c(t) = 18cos\left(120\pi t + \frac{\pi}{2}\right)$

5) The amplitude of a sound wave produced by middle C is 1.5, and the frequency is 264 Hz. Determine an equation for a sinusoidal function describing this sound.

6) The amplitude of a sound wave produced by the note E above middle C is 0.8, and the frequency is 330 Hz. Determine an equation for a sinusoidal function representing this sound.

7) A weight suspended from a spring is set into oscillating motion by compressing it to a point 3 cm above its rest position and releasing it. It takes 1.2 seconds for the weight to complete one cycle. Determine an equation to describe the position of the weight at time t seconds, letting position 0 represent its rest position.

8) A weight suspended from a spring is set into oscillating motion by compressing it to a point 10.4 cm below its rest position and releasing it. It takes 4 seconds for the weight to complete one cycle. Determine an equation that describes the position of the weight at time t seconds; let position 0 represent its rest position.

9) A person is seated on a Ferris wheel of radius 110 ft that makes one rotation every 35 seconds. The center of the wheel is 114 ft above the ground. Determine and graph an equation to represent the person's height above the ground at any time t of a 3 minute ride. Assume that the ride begins at the bottom of the wheel.

10) A person is seated on a Ferris wheel of radius 100 ft that makes one rotation every 30 seconds. The center of the wheel is 105 ft above the ground. Find and graph a function to represent the person's height above the ground at any time t of a 2 minute ride. Assume uniform speed from the beginning to the end of the ride and that the person is at the level of the center of the wheel and headed up when the ride begins.

11) The highest tides in the world are found in the Bay of Fundy in Nova Scotia. The motion of these tides is simple harmonic motion, and so can be described by a sinusoidal function. At high tide the water is approximately 4 meters above sea level, and at low tide 4 meters below; the time between tides is approximately 12 hours. Determine and graph an equation describing the motion of the tides. Assume that it is high tide at $t = 0$ hours.

12) How many meters does the tide in the Bay of Fundy drop 1 hour after high tide? Refer to problem 11.

13) High tide in an un-named bay is 2.6 m above sea level, and low tide is 2.6 m below sea level. The time between high tides is 12.25 hours. Use a sinusoidal function to describe the motion of the tides, assuming that it is low tide at $t = 0$ hours.

14) A weight suspended from a spring is oscillation in simple harmonic motion. It completes 5 cycles of its motion every second. If the distance from the highest point to the lowest point of the oscillation is 80 cm, determine an equation that models the motion of the mass. Assume the weight is at its highest point at $t = 0$ hours.