Name _____ Date _____ Class _____

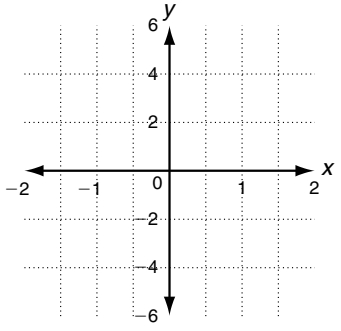
LESSON 14-1

Practice B

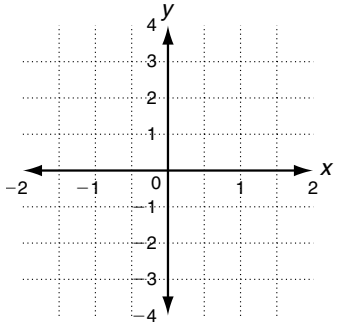
Graphs of Sine and Cosine

Using $f(x) = \sin x$ or $g(x) = \cos x$ as a guide, graph each function. Identify the amplitude and period.

1. $b(x) = -5\sin\pi x$

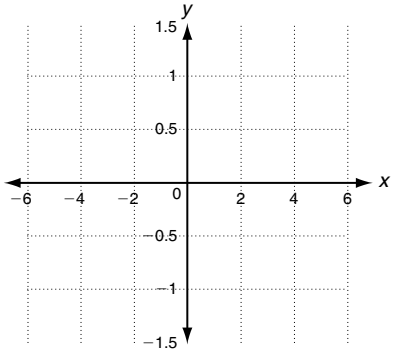


2. $k(x) = 3\cos 2\pi x$

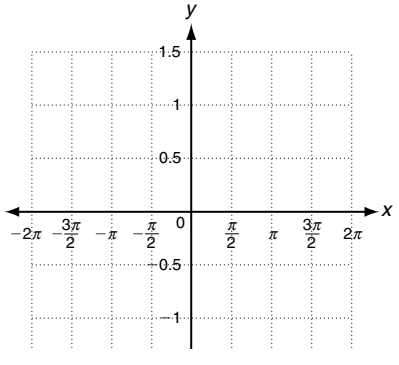


Using $f(x) = \sin x$ or $g(x) = \cos x$ as a guide, graph each function. Identify the x-intercepts and phase shift.

3. $h(x) = \sin\left(x + \frac{\pi}{4}\right)$



4. $h(x) = \cos\left(x - \frac{\pi}{4}\right)$

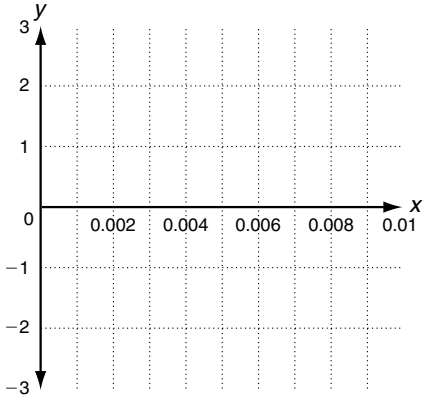


Solve.

5. a. Use a sine function to graph a sound wave with a period of 0.002 second and an amplitude of 2 centimeters.

b. Find the frequency in hertz for this sound wave.

_____

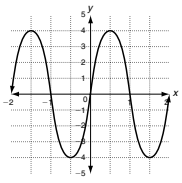


LESSON 14-1

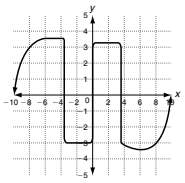
Practice A

Graphs of Sine and Cosine

Identify whether each function is periodic. If the function is periodic, give the period.

1. 

Periodic; 2

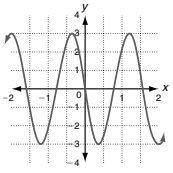
2. 

Not periodic

Use $f(x) = \sin x$ or $g(x) = \cos x$ as a guide. Identify the amplitude and period. Then graph each function.

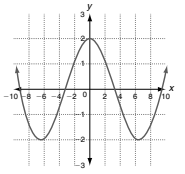
3. $h(x) = -3\sin 4x$

Amplitude: 3; period: $\frac{\pi}{2}$



4. $p(x) = 2\cos(0.5x)$

Amplitude: 2; period: 4π



Use $f(x) = \cos x$ as a guide. Graph the function.

5. $g(x) = \cos(x - \pi)$

   a. Identify the amplitude and period.

   Amplitude: 1; period: 2π

   b. Identify the phase shift.

   π radians to the right

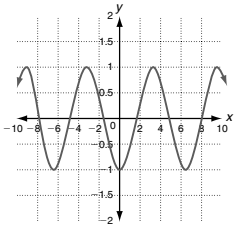
   c. Identify the x-intercepts.

   $\frac{\pi}{2} + n\pi$, where n is an integer

   d. Identify the maximum and minimum values.

   1, −1

   e. Use the information to graph the function.



LESSON 14-1

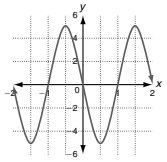
Practice B

Graphs of Sine and Cosine

Using $f(x) = \sin x$ or $g(x) = \cos x$ as a guide, graph each function. Identify the amplitude and period.

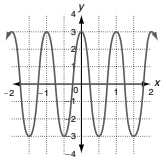
1. $b(x) = -5\sin \pi x$

Amplitude: 5; period: 2



2. $k(x) = 3\cos 2\pi x$

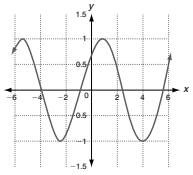
Amplitude: 3; period: 1



Using $f(x) = \sin x$ or $g(x) = \cos x$ as a guide, graph each function. Identify the x-intercepts and phase shift.

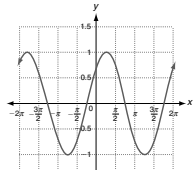
3. $h(x) = \sin\left(x + \frac{\pi}{4}\right)$

x-intercepts: $\frac{3\pi}{4}$, $\frac{7\pi}{4}$, phase shift: $\frac{\pi}{4}$ radians to the left



4. $h(x) = \cos\left(x - \frac{\pi}{4}\right)$

x-intercepts: $\frac{3\pi}{4}$, $\frac{7\pi}{4}$, phase shift: $\frac{\pi}{4}$ radians to the right

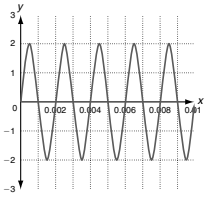


Solve.

5. a. Use a sine function to graph a sound wave with a period of 0.002 second and an amplitude of 2 centimeters.

   b. Find the frequency in hertz for this sound wave.

   500 Hz



LESSON 14-1

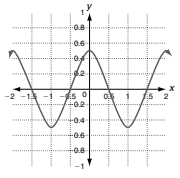
Practice C

Graphs of Sine and Cosine

Using $f(x) = \sin x$ or $f(x) = \cos x$ as a guide, graph each function. Identify the amplitude, period, x-intercepts, and phase shift.

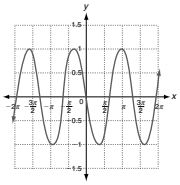
1. $h(x) = \frac{1}{2}\cos(-\pi x)$

Amplitude: 0.5; period: 2; x-intercepts: 0.5, 1.5; phase shift: 0



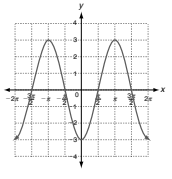
2. $q(x) = -\sin\left(\frac{\pi}{2}x\right)$

Amplitude: 1; period: 4; x-intercepts: 0, 2, 4; phase shift: 0



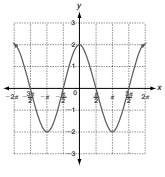
3. $c(x) = 3\cos(x + \pi)$

Amplitude: 3; period: 2π; x-intercepts: $\frac{\pi}{2}$, $\frac{3\pi}{2}$; phase shift: π radians to the left



4. $h(x) = -2\sin\left(x - \frac{\pi}{2}\right)$

Amplitude: 2; period: 2π; x-intercepts: $\frac{\pi}{2}$, $\frac{3\pi}{2}$; phase shift: $\frac{\pi}{2}$ radians to the right



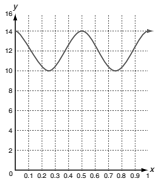
Solve.

5. A manual metronome is an inverted pendulum that helps musicians play to the beat. The number of centimeters, C, that the tip of the pendulum is from a tabletop can be modeled by $C(t) = 2\cos 4\pi t + 12$, where t is the time in seconds.

   a. Graph the height of the pendulum tip for 2 periods.

   b. How high is the pendulum when $t = \frac{1}{4}$ second?

   10 cm



LESSON 14-1

Reteach

Graphs of Sine and Cosine

Transformations of the sine and cosine functions change the amplitude and/or the period of the graph.

For $y = a\sin bx$ or $y = a\cos bx$:

- the amplitude is $|a|$,
- the period is $\frac{2\pi}{|b|}$.

The amplitude is half the difference between the greatest and least values of the function.

One full cycle appears in each period.

Use the graph of $f(x) = \sin x$ to sketch the graph of $g(x) = 0.5\sin 2x$.

Step 1 Compare $g(x) = 0.5\sin 2x$ to $y = a\sin bx$. Find a to identify the amplitude.

$a = 0.5$ and $|0.5| = 0.5$, so the amplitude is 0.5.

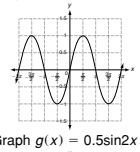
The maximum value of $g(x)$ is 0.5 and the minimum value is −0.5.

Step 2 Find b to identify the period.

$b = 2$, and $\frac{2\pi}{|b|} = \frac{2\pi}{|2|} = \pi$, so the period is π.

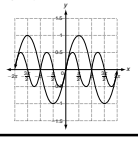
One full cycle appears in the interval from 0 to π.

Step 3 Graph $f(x) = \sin x$.



The **amplitude** is 1. The maximum and minimum values of $f(x)$ are 1 and −1. The **period** is 2π. One full cycle appears in the interval from 0 to 2π. Two full cycles appear in the interval from -2π to 2π. The x-intercepts are at multiples of π.

Step 4 Graph $g(x) = 0.5\sin 2x$ on the same plane as $f(x)$.



The **amplitude** is 0.5. The maximum and minimum values of $g(x)$ are 0.5 and −0.5. The **period** is π. One full cycle appears in the interval from 0 to π. Two full cycles appear in the interval from 0 to 2π and from -2π to 0. The x-intercepts are at multiples of $\frac{\pi}{2}$.

Complete to graph $h(x) = 0.5\cos 2x$.

1. Find the amplitude of $h(x)$. $a =$ 0.5
2. Find the period of $h(x)$. $\frac{2\pi}{|b|} =$ π
3. What are the maximum and minimum values of $h(x)$? 0.5, −0.5
4. How many full cycles appear in the interval from 0 to π? 1 cycle
5. Sketch the graph of $f(x) = \cos x$. Then graph $h(x) = 0.5\cos 2x$.