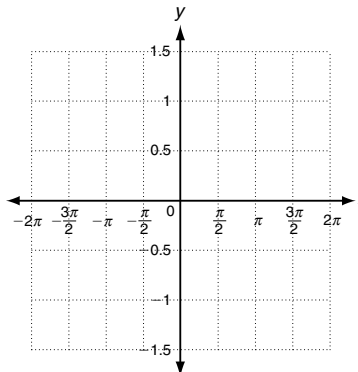
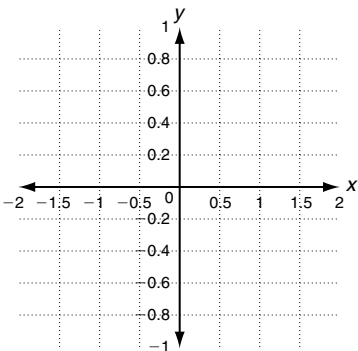


LESSON **Practice C**
14-1 *Graphs of Sine and Cosine*

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.

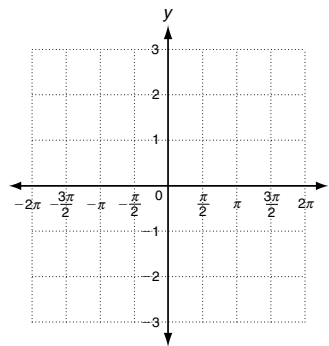
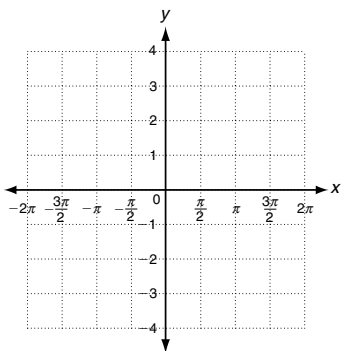
1. $h(x) = \frac{1}{2}\cos(-\pi x)$

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



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

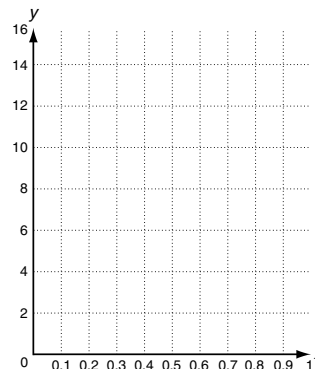
4. $h(x) = -2\sin\left(x - \frac{\pi}{2}\right)$



Solve.

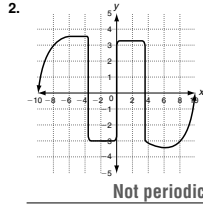
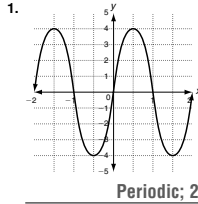
5. A manual metronome is an inverted pendulum that helps musicians play to the beat. The number of centimeters, C , that the tip of the pendulum is from a tabletop can be modeled by $C(t) = 2\cos 4\pi t + 12$, where t is the time in seconds.

- a. Graph the height of the pendulum tip for 2 periods.
 b. How high is the pendulum when $t = \frac{1}{4}$ second?



LESSON 14-1 Practice A
Graphs of Sine and Cosine

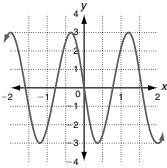
Identify whether each function is periodic. If the function is periodic, give the period.



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

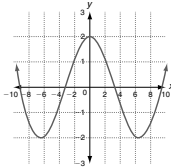
3. $h(x) = -3\sin 4x$

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

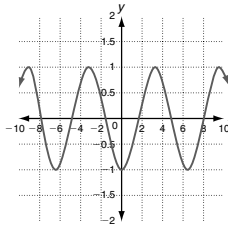
a. Identify the amplitude and period.
Amplitude: 1; period: 2π

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.



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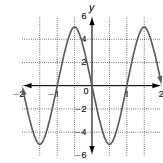
Holt Algebra 2

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.

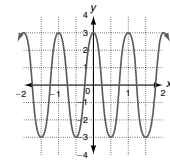
1. $b(x) = -5\sin \pi x$

Amplitude: 5; period: 2



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

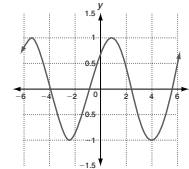
Amplitude: 3; period: 1



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

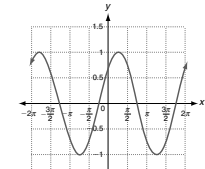
3. $h(x) = \sin(x + \frac{\pi}{4})$

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



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

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

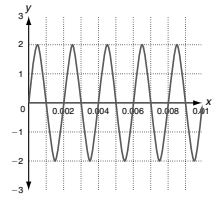


Solve.

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



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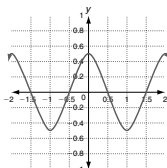
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LESSON 14-1 Practice C
Graphs of Sine and Cosine

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.

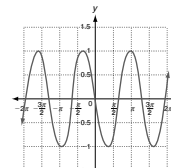
1. $h(x) = \frac{1}{2}\cos(-\pi x)$

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



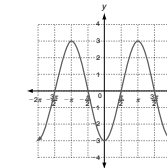
2. $q(x) = -\sin(\frac{\pi}{2}x)$

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



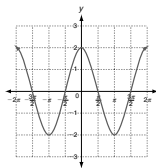
3. $c(x) = 3\cos(x + \pi)$

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



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

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



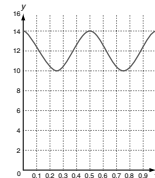
Solve.

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



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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.

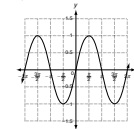
The maximum value of $g(x)$ is 0.5 and the minimum value is -0.5 .

- 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 .

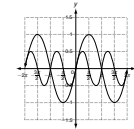
One full cycle appears in the interval from 0 to π .

- 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 .

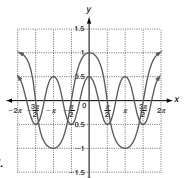
- Step 4 Graph $g(x) = 0.5\sin 2x$ on the same plane as $f(x)$.



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 $h(x) = 0.5\cos 2x$.

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



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