Unit 6 Review Day 1

Unit Circle and Trig Identities

$\sin(x)$ *Identities*

$\sin(-x) = -\sin(x)$

$\sin(x+\pi) = -\sin(x)$

$\sin(x+2\pi) = \sin(x)$

$\cos(x)$ *Identities*

$\cos(-x) = \cos(x)$

$\cos(x+\pi) = -\cos(x)$

$\cos(x+2\pi) = \cos(x)$

1. Evaluate each of the following without a calculator using a trigonometric identity when needed.

$\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(-\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(\frac{7\pi}{6}\right)$

$\cos\left(\pi+\frac{\pi}{6}\right) = -\frac{\sqrt{3}}{2}$

$\cos\left(\frac{13\pi}{6}\right)$

$\cos\left(2\pi+\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(\frac{25\pi}{6}\right)$

$\cos\left(4\pi+\frac{\pi}{6}\right)$

$\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(\frac{19\pi}{6}\right)$

$\cos\left(3\pi+\frac{\pi}{6}\right)$

$-\frac{\sqrt{3}}{2}$

$\cos\left(\frac{67\pi}{6}\right)$

$\cos\left(11\pi+\frac{\pi}{6}\right)$

$-\frac{\sqrt{3}}{2}$

$\cos\left(\frac{61\pi}{6}\right)$

$\cos\left(10\pi+\frac{\pi}{6}\right)$

$\frac{\sqrt{3}}{2}$

$\cos\left(\frac{19\pi}{6}\right)$

$-\frac{\sqrt{3}}{2}$

$\cos\left(-\frac{37\pi}{6}\right)$

$\cos\left(\frac{37\pi}{6}\right)$

$\cos\left(6\pi+\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\cos\left(\frac{7\pi}{3}\right)$

$\cos\left(2\pi+\frac{\pi}{3}\right)$

$\frac{1}{2}$

$\cos\left(\frac{13\pi}{4}\right)$

$\cos\left(3\pi+\frac{\pi}{4}\right)$

$-\frac{\sqrt{2}}{2}$

$\cos\left(\frac{25\pi}{4}\right)$

$\cos\left(6\pi+\frac{\pi}{4}\right)$

$\frac{\sqrt{2}}{2}$

$\cos\left(-\frac{19\pi}{6}\right)$

$\cos\left(\frac{19\pi}{6}\right)$

$\cos\left(3\pi+\frac{\pi}{6}\right)$

$-\frac{\sqrt{3}}{2}$

$\cos\left(-\frac{61\pi}{6}\right)$

$\cos\left(\frac{61\pi}{6}\right)$

$\cos\left(10\pi+\frac{\pi}{6}\right)$

$\frac{\sqrt{3}}{2}$

$\cos\left(\frac{31\pi}{6}\right)$

$\cos\left(5\pi+\frac{\pi}{6}\right)$

$-\frac{\sqrt{3}}{2}$

2. Evaluate each of the following without a calculator using a trigonometric identity when needed.

$\sin\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}$	$\sin\left(\frac{11\pi}{4}\right)$ $\sin(2\pi+\frac{3\pi}{4})$ $\frac{\sqrt{2}}{2}$	$\sin\left(\frac{7\pi}{4}\right)$ $\sin(\pi+\frac{3\pi}{4})$ $-\frac{\sqrt{2}}{2}$	$\sin\left(\frac{-5\pi}{4}\right)$ $-\sin(\frac{5\pi}{4})$ $-\sin(\pi+\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$
$\sin\left(\frac{13\pi}{4}\right)$ $\sin(3\pi+\frac{\pi}{4})$ $-\frac{\sqrt{2}}{2}$	$\sin\left(\frac{17\pi}{4}\right)$ $\sin(4\pi+\frac{\pi}{4})$ $\frac{\sqrt{2}}{2}$	$\sin\left(\frac{21\pi}{4}\right)$ $\sin(5\pi+\frac{\pi}{4})$ $-\frac{\sqrt{2}}{2}$	$\sin\left(\frac{41\pi}{4}\right)$ $\sin(10\pi+\frac{\pi}{4})$ $\frac{\sqrt{2}}{2}$
$\sin\left(\frac{13\pi}{4}\right)$ $\sin(3\pi+\frac{\pi}{4})$ $-\frac{\sqrt{2}}{2}$	$\sin\left(\frac{25\pi}{6}\right)$ $\sin(4\pi+\frac{\pi}{6})$ $\frac{1}{2}$	$\sin\left(\frac{17\pi}{4}\right)$ $\sin(4\pi+\frac{\pi}{4})$ $\frac{\sqrt{2}}{2}$	$\sin\left(\frac{-\pi}{4}\right)$ $-\sin(\frac{\pi}{4})$ $-\frac{\sqrt{2}}{2}$
$\sin\left(-\frac{13\pi}{4}\right)$ $-\sin(\frac{13\pi}{4})$ $-\sin(3\pi+\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$	$\sin\left(\frac{16\pi}{3}\right)$ $\sin(5\pi+\frac{\pi}{3})$ $-\frac{\sqrt{3}}{2}$	$\sin\left(-\frac{22\pi}{3}\right)$ $-\sin(\frac{22\pi}{3})$ $-\sin(7\pi+\frac{\pi}{3})$ $\sin(\frac{\pi}{3}) = \frac{\sqrt{3}}{2}$	$\sin\left(\frac{43\pi}{6}\right)$ $\sin(7\pi+\frac{\pi}{6})$ $-\frac{1}{2}$

Which trig value has the same value as $\sin\left(\frac{19\pi}{6}\right)$?

$\sin(3\pi+\frac{\pi}{6})$

$-\sin(\frac{\pi}{6})$

$\sin\left(\frac{\pi}{6}\right)$

$-\sin\left(\frac{\pi}{6}\right)$

$\sin\left(\frac{13\pi}{6}\right)$

$\sin\left(\frac{5\pi}{6}\right)$

Which trig value has the same value as $\cos\left(\frac{\pi}{6}\right)$?

$\sin\left(\frac{\pi}{6}\right)$

$-\cos\left(\frac{\pi}{6}\right)$ None

$\cos\left(\frac{5\pi}{6}\right)$

$\cos\left(\frac{7\pi}{6}\right)$

Amp

17. What is the amplitude of the graph of the equation $y = 2\sin\frac{1}{2}x$?

● [1] 1/2 ● [2] 2 ○ [3] π ○ [4] 2π

18. A sound wave is modeled by the curve $y = 3\sin 4x$. What is the period of this curve? $\nearrow w$

○ [1] π ● [2] $\pi/2$ ○ [3] 3 ○ [4] 4

$P = \frac{2\pi}{w}$ $w = 4$ $P = \frac{2\pi}{4} = \frac{\pi}{2}$

19. The graph of the function $y = 3\sin(2x + \pi)$ will display a horizontal shift of

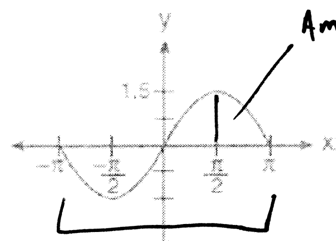
○ [1] π units to the right
○ [2] π units to the left
○ [3] $\pi/2$ units to the right
● [4] $\pi/2$ units to the left

$3\sin\left(2\left(x+\frac{\pi}{2}\right)\right)$

$\hookrightarrow \frac{\pi}{2}$ left

20. A radio transmitter sends a radio wave from the top of a 50-foot tower. The wave is represented by the graph shown at the right. What is the equation of this radio wave?

○ [1] $y = \cancel{\sin x}$
● [2] $y = 1.5\sin x$
○ [3] $y = \sin\cancel{1.5}x$
○ [4] $y = \cancel{2\sin}x$



Amp: 1.5

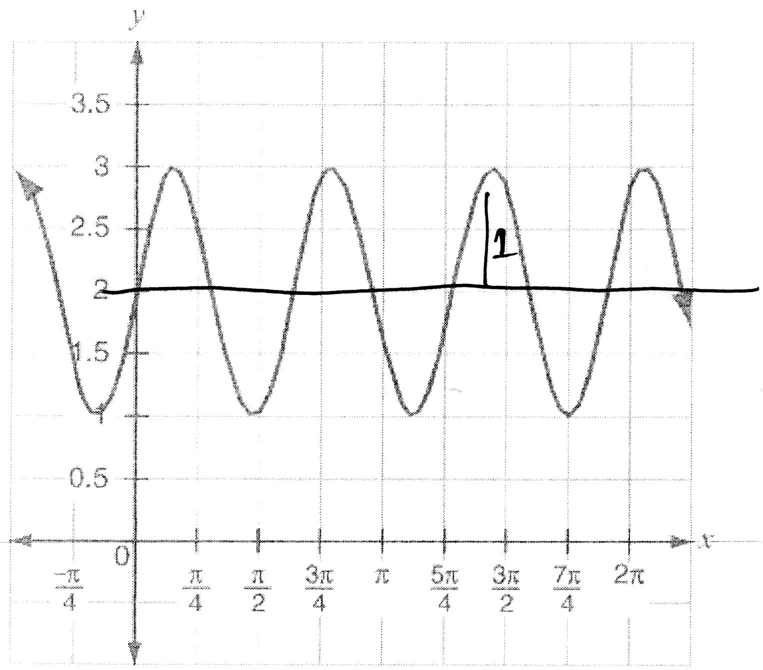
Per: 2π

$2\pi = \frac{2\pi}{w}$

$w = 1$

Directions: Answer the following question(s).

1 This graph shows a periodic function.



Midline: 2

Amp: 1

Which description of the graph is correct?

A. amplitude = 1, midline at $y = 2$

B. amplitude = 2, midline at $y = 1$

C. amplitude = 2, midline at $y = 2$

D. amplitude = 3, midline at $y = 2$

2 Consider the following information about a trigonometric function *f* below.

The amplitude $A = 2$, period $P = \frac{2\pi}{3}$, the phase shift is $\frac{\pi}{3}$ units to the right, and the vertical shift is 2 units down.

$\boxed{A=2}$ ↳ minus!

$P=\frac{2\pi}{3}$

$\frac{2\pi}{3} = \frac{2\pi}{w}$ $\boxed{w=3}$

What is the equation for *f* in terms of θ ?

A. $f(\theta) = 2\sin(3\theta - \frac{\pi}{2}) - 2$

B. $f(\theta) = \cancel{4}\sin(3\theta - \frac{\pi}{3}) - 2$

Amp 4

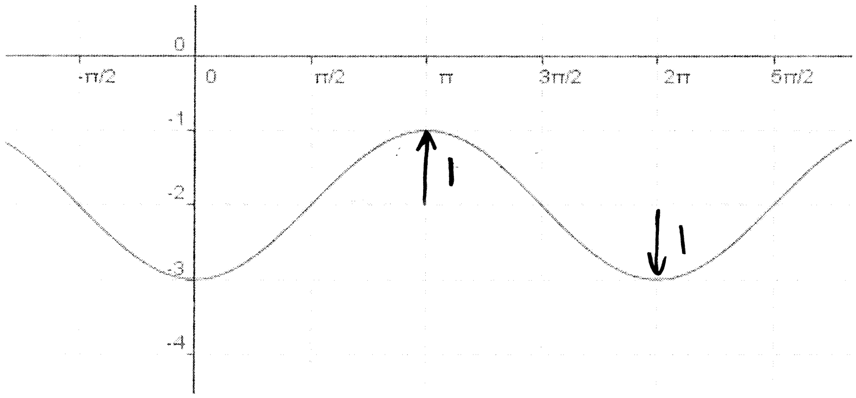
C. $f(\theta) = 2\sin(3\theta + \pi) - 2$

D. $f(\theta) = 2\sin(3\theta - \pi) - 2$

factor! $2\sin(3(\theta - \frac{\pi}{3})) - 2$

Directions: Answer the following question(s).

3 What is the amplitude of this function?



A. -2

B. 1

C. 2

D. 2Π

Directions: Answer the following question(s).

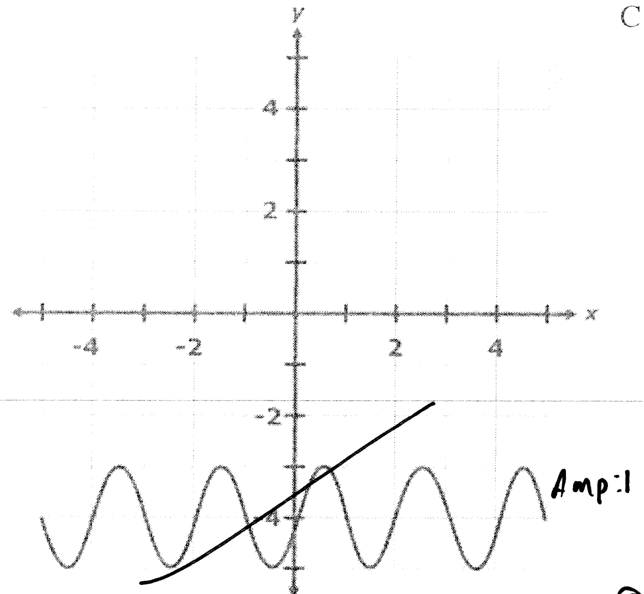
4 A student studying radio signals decided to focus in on a certain radio station to determine the graph of the radio signals used. The student determined that the radio station uses the following function for its radio signals.

$w = \pi$

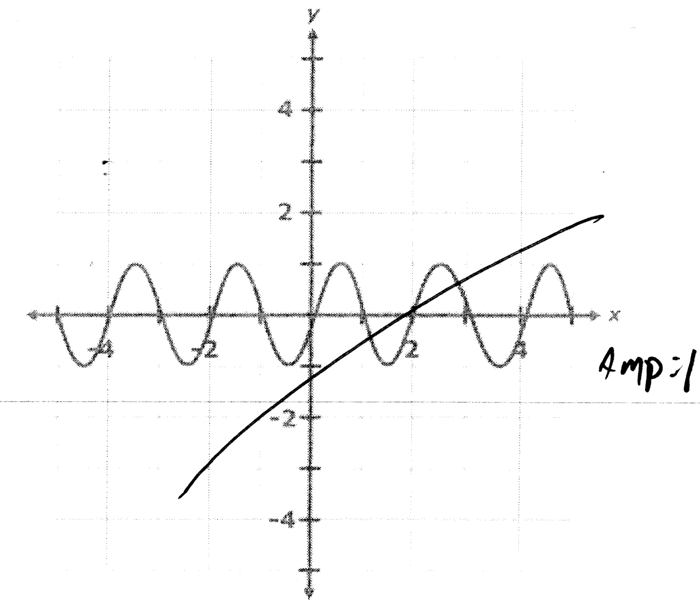
$f(x) = 4\sin(\pi x)$ Amp: 4 $Per = \frac{2\pi}{\pi} = 2$

Which of the following options correctly graphs the function of the radio station's radio signal?

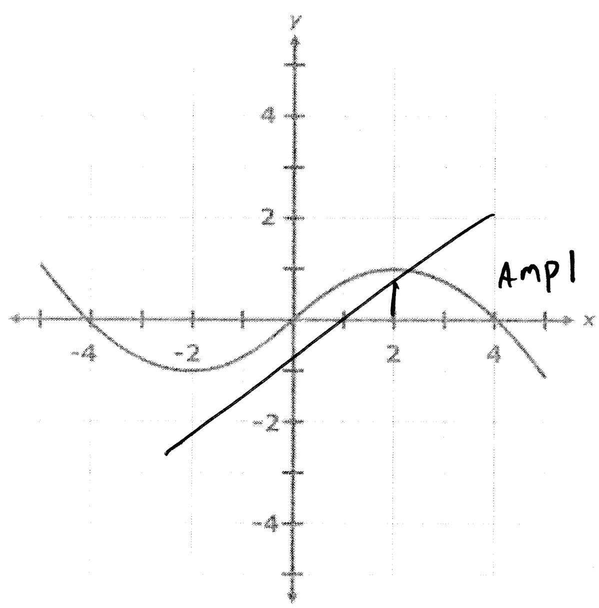
A.



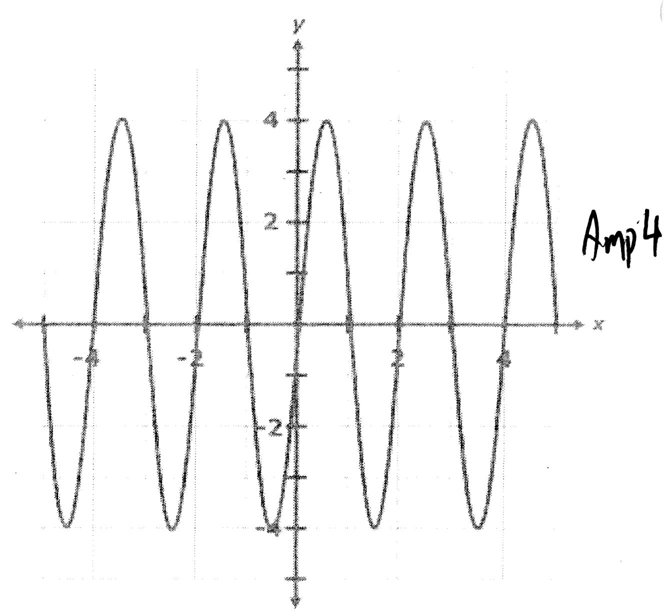
C.



B.



D.



Directions: Answer the following question(s).

5 Kyle is working in the lab using sound waves and finding the models to describe the sound waves. He neglected to find the model of the sound wave shown below.

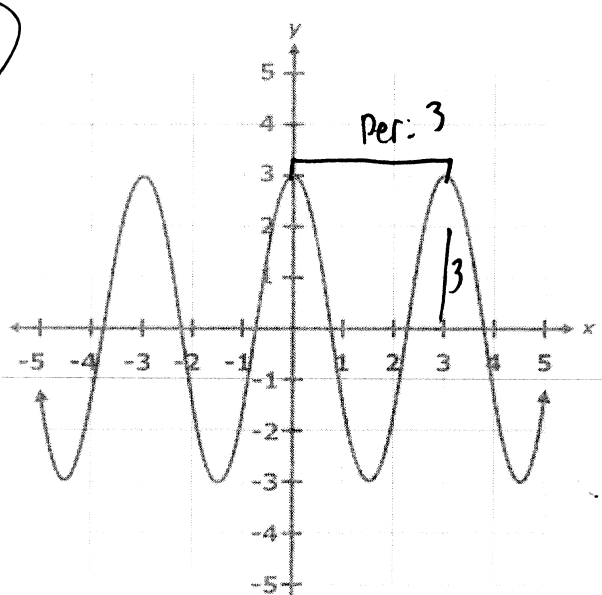
$$f(x) = 3\cos\left(\frac{2\pi}{3}x\right)$$

Amp: 3
$w = \frac{2\pi}{3}$

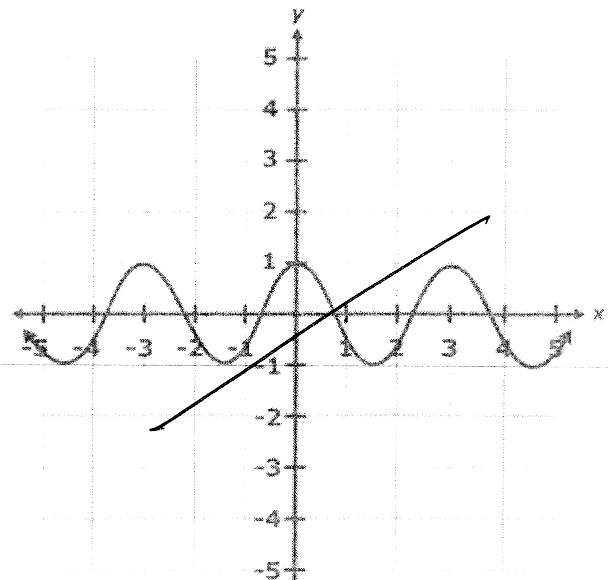
$P = \frac{2\pi}{\frac{2\pi}{3}} = \cancel{2\pi} \cdot \frac{3}{\cancel{2\pi}} = 3$

Which graph of the sound wave correctly matches the equation above?

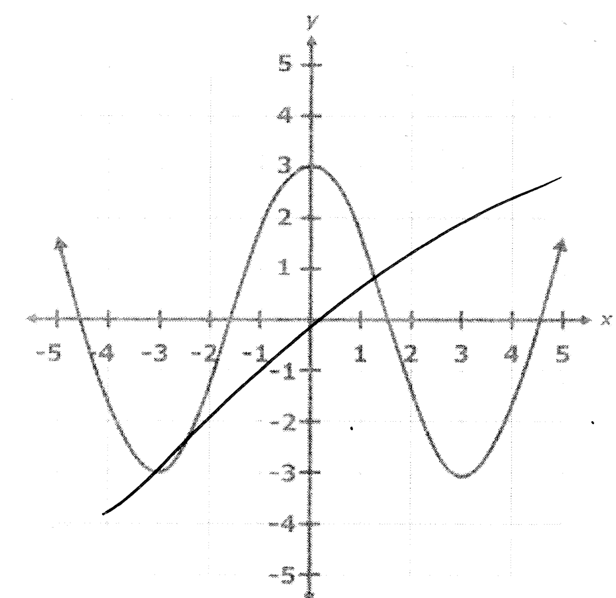
A.



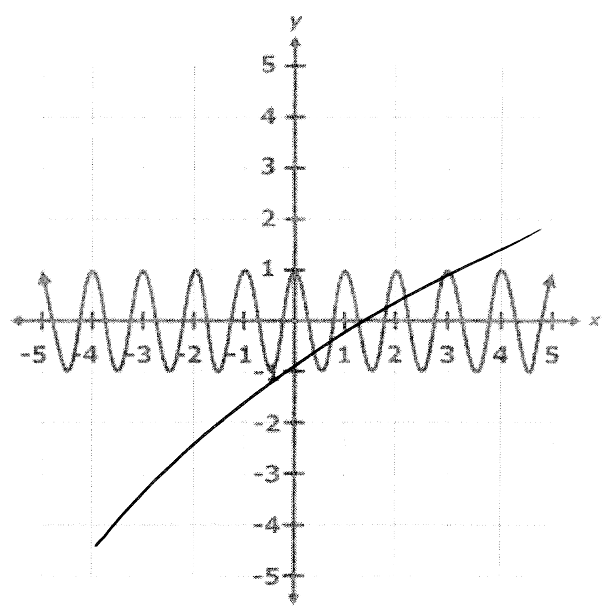
C.



B.

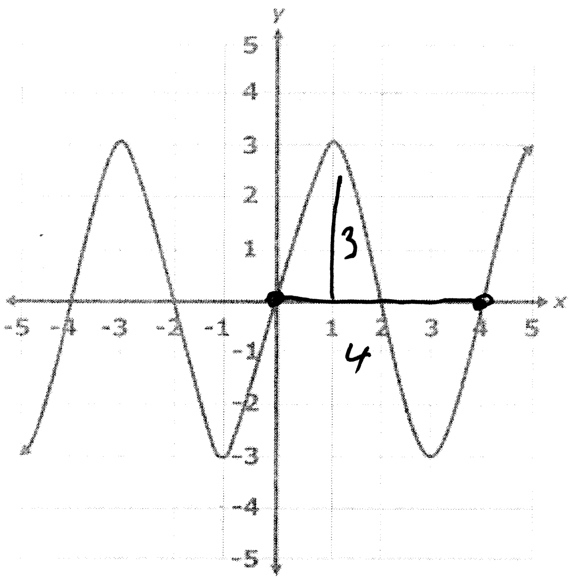


D.



Directions: Answer the following question(s).

6



Amp: 3

Per: 4

$4 = \frac{2\pi}{w}$

$w = \frac{\pi}{2}$

sine function b/c starts at (0,0)

Mark is listening to his radio and tunes it to the frequency represented above. Which equation can Mark use to describes the graph for the frequency of the radio?

A. $\cancel{3\cos\left(\frac{\pi}{2}x\right)}$

B. $\cancel{3\sin(\pi x)}$

C. $3\sin\left(\frac{\pi}{2}x\right)$

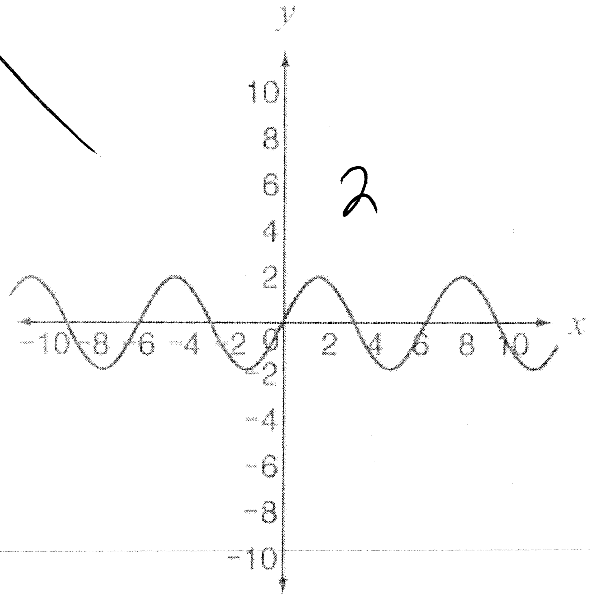
D. $\cancel{6\sin\left(\frac{\pi}{2}x\right)}$

Continue: Turn to the next page.

Directions: Answer the following question(s).

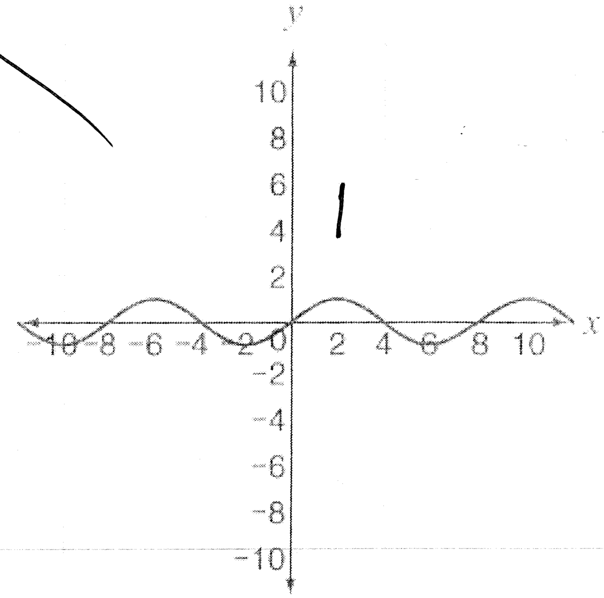
7 Which function has an amplitude of 4 units?

A.



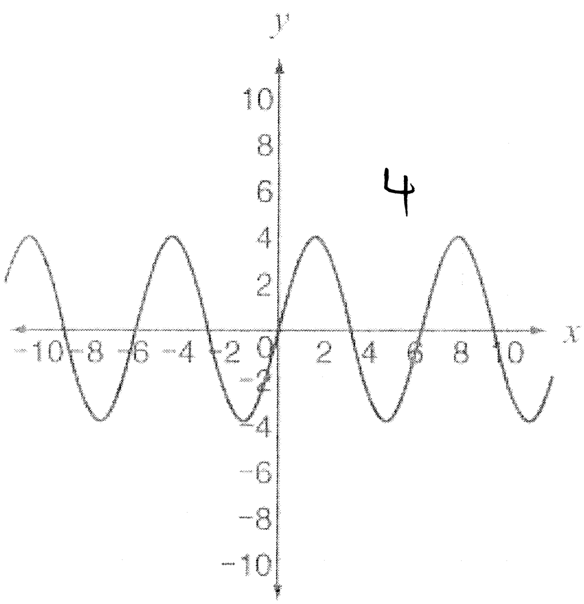
2

C.



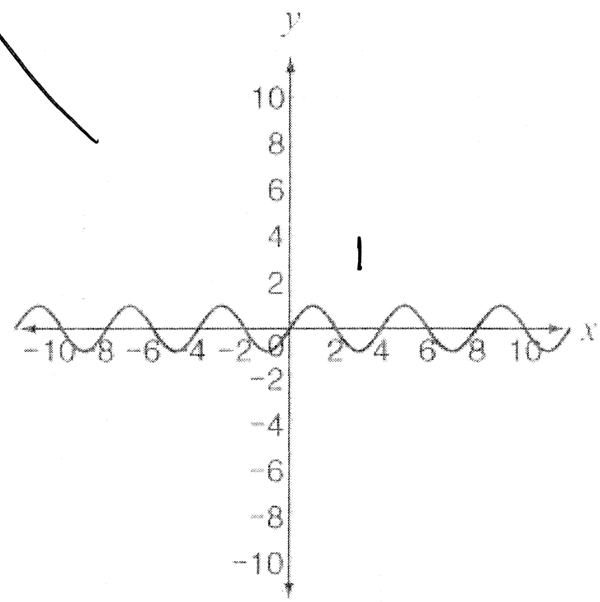
1

B.



4

D.

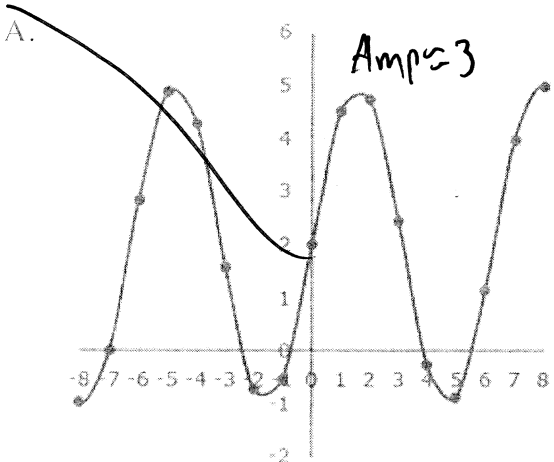


1

Directions: Answer the following question(s).

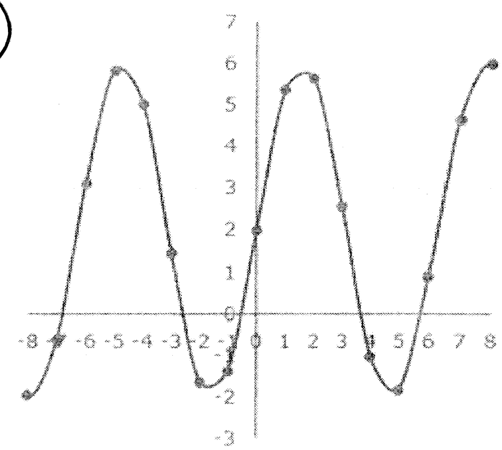
8 **Which graph below has a midline about 2, an amplitude of about 4, and a period of about 7?**

A.

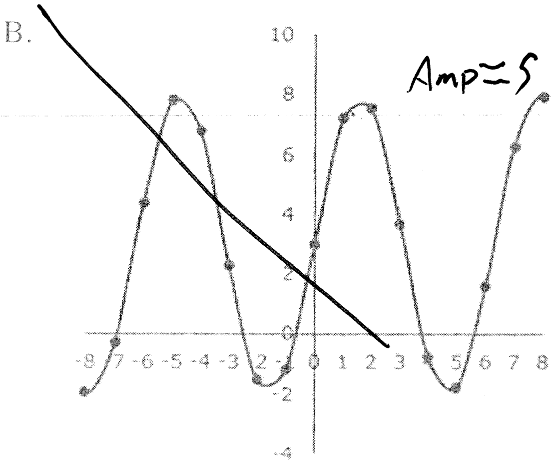


Amp≃3

C.

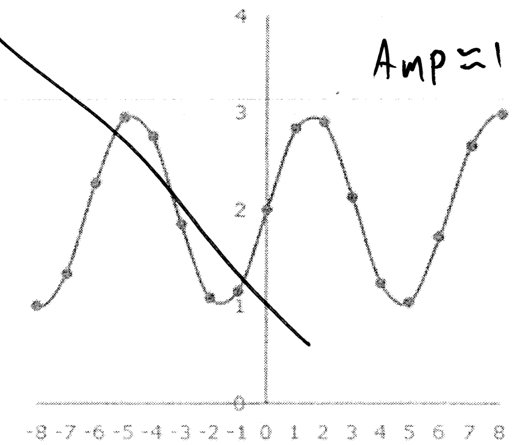


B.



Amp≃5

D.



Amp≃1

9 **A reflector is attached to the wheel of a mountain bike. The height, *h*, in inches, of this reflector with respect to the ground can be modeled by the function below, where *t* is the time, in seconds.**

$h(t) = 13 + 9.5\cos\left(\frac{40\pi}{3}t\right)$ Midline is 13. If midline is 13 and amp is 9.5 Max is 22.5

When the function is graphed on a coordinate plane, which of the following interpretations are correct? Select the *three* correct interpretations.

A. The midline of the height of the reflector is 9.5 inches.

B. The midline of the height of the reflector is 13.0 inches.

C. The maximum height reached by the reflector is 22.5 inches.

D. The period indicates that the reflector makes 0.15 of a complete turn per second.

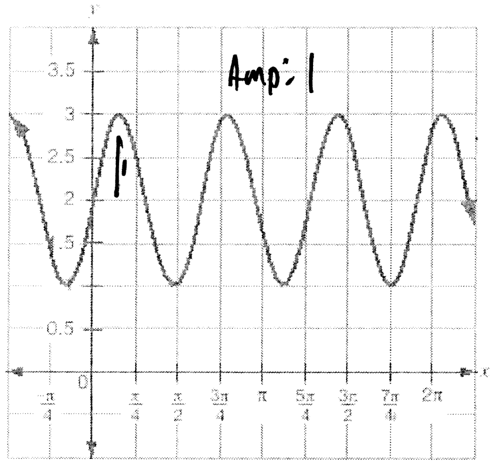
E. The period indicates that the reflector makes a complete turn every 0.15 seconds.

$w = \frac{40\pi}{3}$

$P = \frac{2\pi}{\frac{40\pi}{3}} = 2\cancel{\pi}\frac{3}{40\cancel{\pi}} = \frac{6}{40} = \frac{3}{20} = 0.15$ time for one cycle

Directions: Answer the following question(s).

10 This graph shows a periodic function.



midline: 2

Which description of the graph is correct?

A. amplitude = 1, midline at $y = 2$

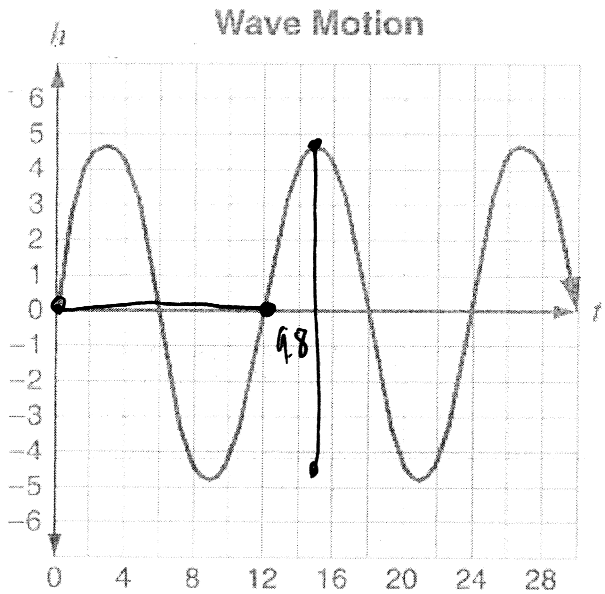
B. amplitude = 2, midline at $y = 1$

C. amplitude = 2, midline at $y = 2$

D. amplitude = 3, midline at $y = 2$

Directions: Answer the following question(s).

11 An ocean buoy is used to measure the motion of waves. This graph represents a model of wave motion, where the height, h, is measured in feet and the time, t, is measured in seconds.



Amp is 4.9

Starts at (0,0): sine

12 seconds is Period

$12 = \frac{2\pi}{w}$ $w = \frac{2\pi}{12} = \frac{\pi}{6}$

The difference between the crest (highest point) and trough (lowest point) of the wave is measured at 9.8 feet.

Which equation can be used to model the wave motion?

A. $h = 4.9\sin\left(\frac{\pi t}{6}\right)$

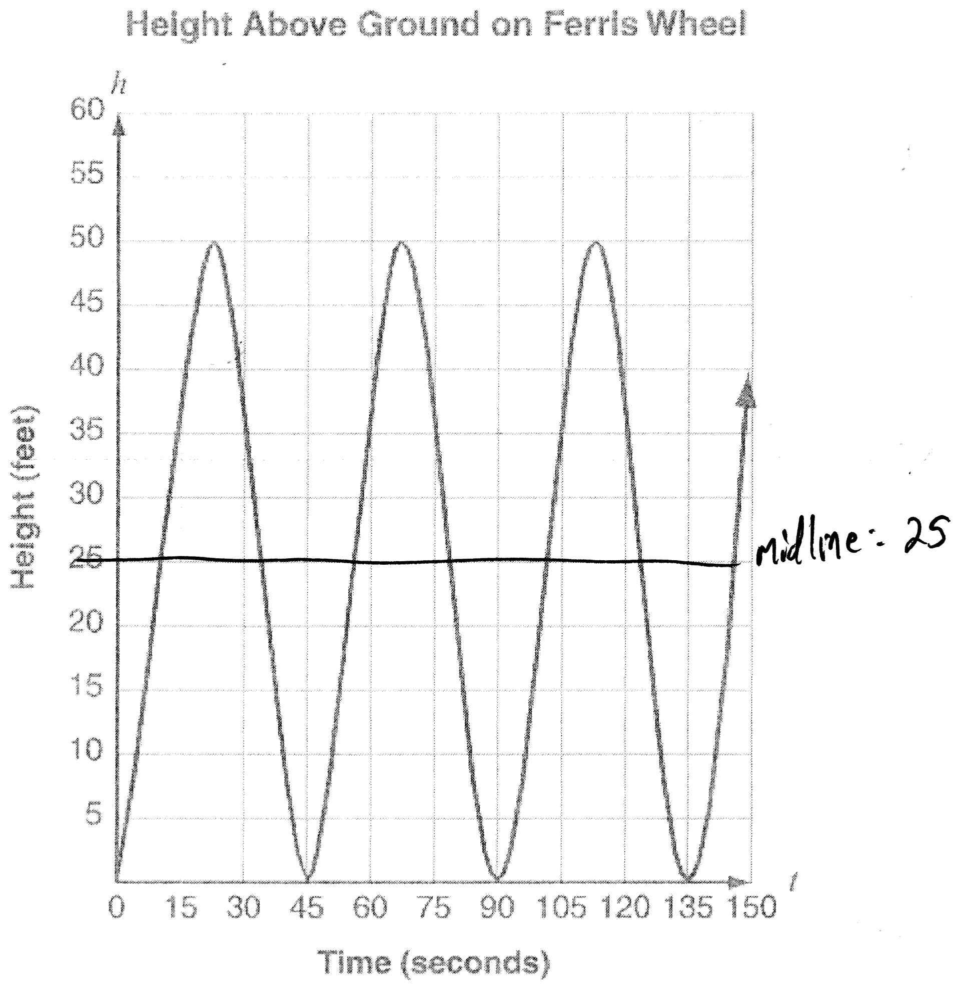
B. $\cancel{h = 4.9\sin\left(\frac{\pi t}{12}\right)}$

C. $\cancel{h = 9.8\sin\left(\frac{\pi t}{6}\right)}$

D. $\cancel{h = 9.8\sin\left(\frac{\pi t}{12}\right)}$

Directions: Answer the following question(s).

12 On a certain Ferris wheel, passengers are loaded at the ground level and rise to a maximum height of 50 feet. This graph represents the height, h, from the ground of a person on the Ferris wheel after t seconds.



Which function can be used to find the height of the person after any number of seconds?

A. $h(t) = 25\cos(0.14t + \pi)$

B. $h(t) = 25\sin(0.14t + \pi)$

C. $h(t) = 25\cos(0.14t + \pi) + 25$

D. $h(t) = 25\sin(0.14t + \pi) + 25$

Example

A carnival has a Ferris wheel that is 44 feet in diameter with 12 passenger cars. When viewed from the side where passengers board, the Ferris wheel rotates **clockwise** and makes half a turn each minute. Riders board the Ferris wheel from a platform that is 15 feet above the ground. We will use what we have learned about periodic functions to model the position of the passenger cars from different mathematical perspectives.

Write an equation for the HEIGHT of the passengers over time?

$A = 22$

$k = 37$

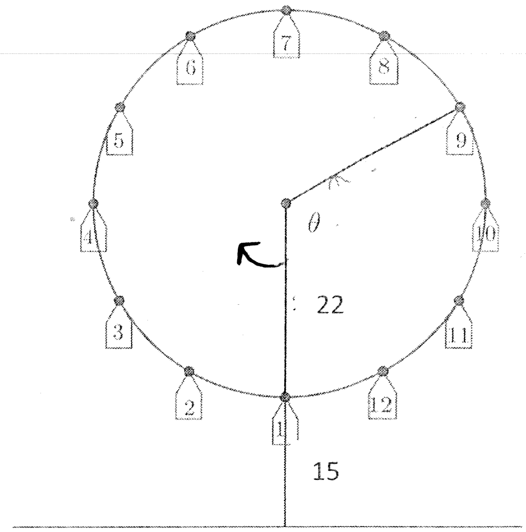
Per: 2 min

$2 = \frac{2\pi}{w}$

$w = \pi$

$y(t) = 22\sin\left(\pi\left(t - \frac{1}{2}\right)\right) + 37$

$h = \frac{\frac{\pi}{2}}{\pi} = \frac{1}{2}$



Write an equation for the CO-HEIGHT of the passengers over time?

$x(t) = 22\cos\left(\pi\left(t - \frac{1}{2}\right)\right)$

Practice 3

A carnival has a Ferris wheel that is 62 feet in diameter with 12 passenger cars. When viewed from the side where passengers board, the Ferris wheel rotates **clockwise** and makes one turn every two minutes. Riders board the Ferris wheel from a platform that is 10 feet above the ground. We will use what we have learned about periodic functions to model the position of the passenger cars from different mathematical perspectives.

Write an equation for the HEIGHT of the passengers over time?

$A = 31$

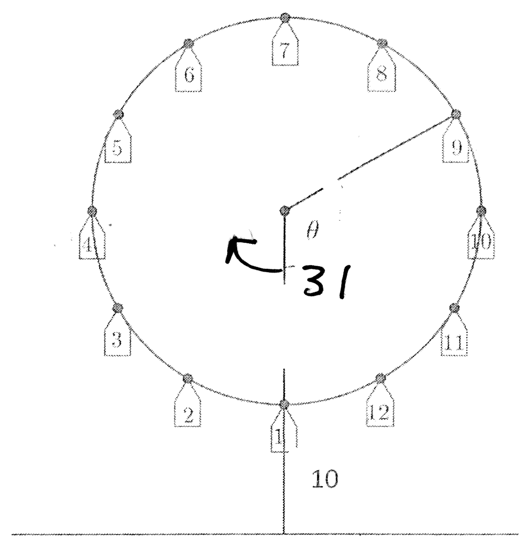
$K = 41$

Per: 2

$2 = \frac{2\pi}{w}$ $w = \pi$

$y(t) = 31\sin\left(\pi\left(t - \frac{1}{2}\right)\right) + 41$

$h = \frac{\frac{\pi}{2}}{\pi} = \frac{1}{2}$



Write an equation for the CO-HEIGHT of the passengers over time?

$x(t) = 31\cos\left(\pi\left(t - \frac{1}{2}\right)\right)$