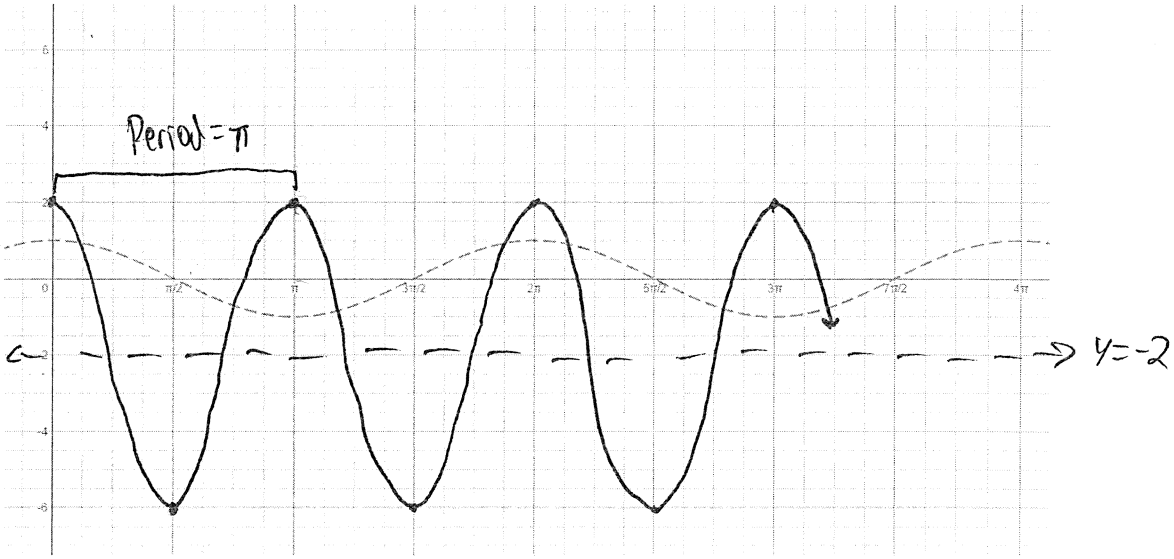
End of Unit Assessment Unit 6 V1

Name _____ Date _____

1.

a. Graph the function $f(x) = 4\cos(2x) - 2$ between 0 and 4π.

Midline: $y = -2$
Amp: 4
$w = 2$
Period: $\frac{2\pi}{2} = \pi$
No reflection or phase shift



b. Graph and label the midline on your graph. Draw and label a segment to represent the period and specify its length.

c. Explain how you can find the midline, period, and amplitude in part (b) from the function $f(x) = 4\cos(2x) - 2$.

Amplitude ↑ midline ↖

$2 = w$

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

d. Write a periodic function that has period 4π, a midline given by the equation $y = 3$, and an amplitude of $\frac{1}{3}$.

$P = 4\pi$

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

$w = \frac{2\pi}{4\pi} = \frac{1}{2}$

Midline: $y = 3$

Amp: $\frac{1}{3}$

$y = \frac{1}{3}\cos\left(\frac{1}{2}\theta\right) + 3$

2. Tidal data for New Canal Station, located on the shore of Lake Pontchartrain, LA, and Lake Charles, LA, are shown below.

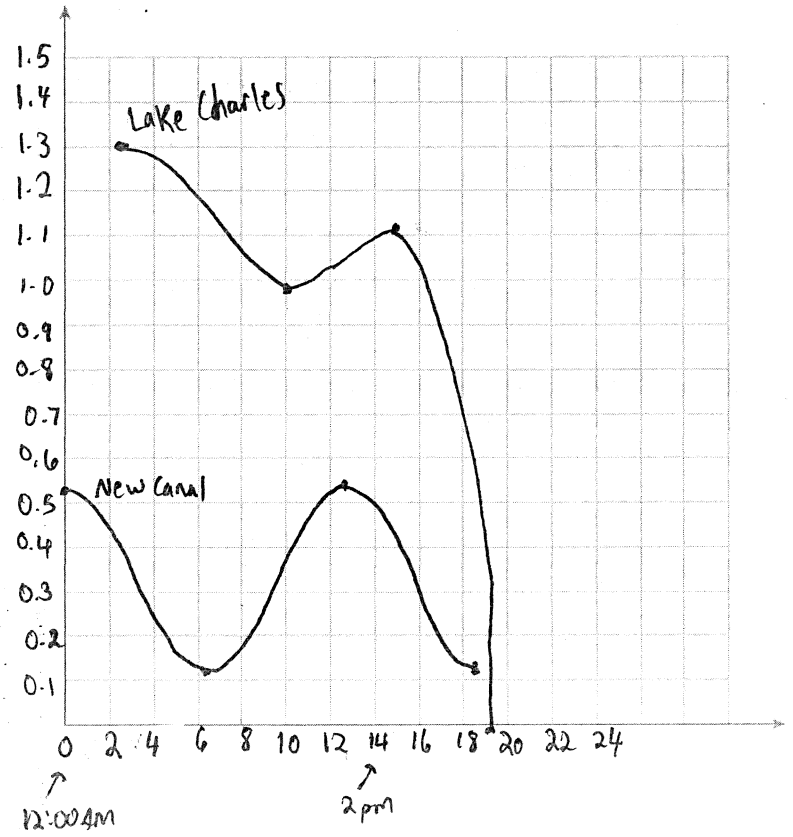
New Canal Station on Lake Pontchartrain, LA, Tide Chart

Date	Day	Time	Height	High/Low
2014/05/28	Wed.	12:00a.m.	0.53	H
2014/05/28	Wed.	06:11a.m.	0.11	L
2014/05/29	Wed.	12:51p.m.	0.53	H
2014/05/29	Wed.	06:58p.m.	0.12	L

Lake Charles, LA, Tide Chart

Date	Day	Time	Height	High/Low
2014/05/28	Wed.	02:20a.m.	1.30	H
2014/05/28	Wed.	10:00a.m.	0.98	L
2014/05/28	Wed.	03:36p.m.	1.11	H
2014/05/28	Wed.	07:05p.m.	−0.05	L

a. Graph both tables on the grid below. Sketch in lines to make them continuous functions. Label the two functions to match each location



b. Would a sinusoidal function of the form $f(x) = A\cos(\omega(x - \square)) + k$ be appropriate to model the given data for each location? Explain your reasoning FOR EACH TABLE.

NEW CANAL STATION:

Yes, the Lake Charles Station values seem to follow a steady cycle.

LAKE CHARLES:

No, the function is WAY too variable. No pattern.

c. Write a sinusoidal function to model the data for New Canal Station.

Midline $\approx$ 0.32
Amp $\approx$ 0.2
period is $\approx$ 12.9

Starts at top: cos(x) w/ no phase shift

$H(t) = 0.2\cos\left(\frac{2\pi}{12.9}t\right) + 0.32$

$12.9 = \frac{2\pi}{w}$

$w = \frac{2\pi}{12.9}$

d. Explain how you chose the numbers in your function from part (c): What is the midline? What is the amplitude? What is the period?

Midline is about 0.32 because the average/middle ht is just over 0.3.
The amplitude is about 0.2 because the cycle goes up to about 0.52 from the midline. $0.52 - 0.32 = 0.2$

The period is about 12.9 hours b/c one high tide occurs at 12:00AM. The next occurs at 12:51 PM; that is $\approx$ 12.9 hours later.

e. A friend looked at the graph and wondered, "What was the average water height at New Canal Station?" What might be a reasonable answer to that question? Use the structure of the function you created in part (c) to explain your answer.

The average ht seems to be about 0.32. The graph has a midline (center) there.

3. A carnival has a Ferris wheel that is 60 feet in diameter with 12 passenger cars. When viewed from the side where passengers board, the Ferris wheel rotates counterclockwise and makes 2 full turns each minute. 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?

Midline: $10+30=40$ shift $-\frac{\pi}{2}$ to start at bottom: $\frac{\frac{\pi}{2}}{4\pi}=\frac{1}{8}$

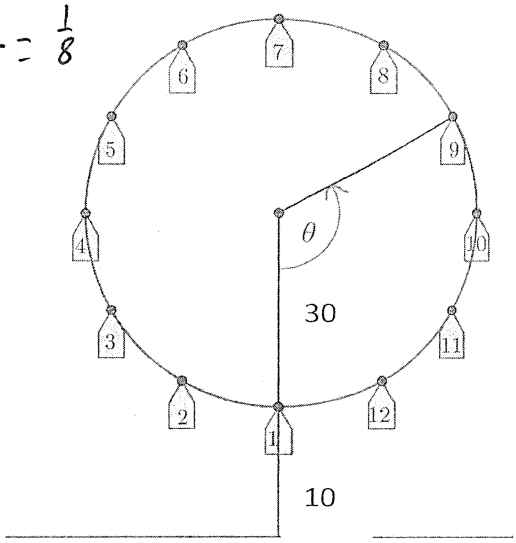
Amp: 30

Period is $\frac{1}{2}$ minute

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

$\omega=4\pi$

$y(t)=30\sin(4\pi(t-\frac{1}{8}))+40$



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

$x(t)=30\cos(4\pi(t-\frac{1}{8}))$

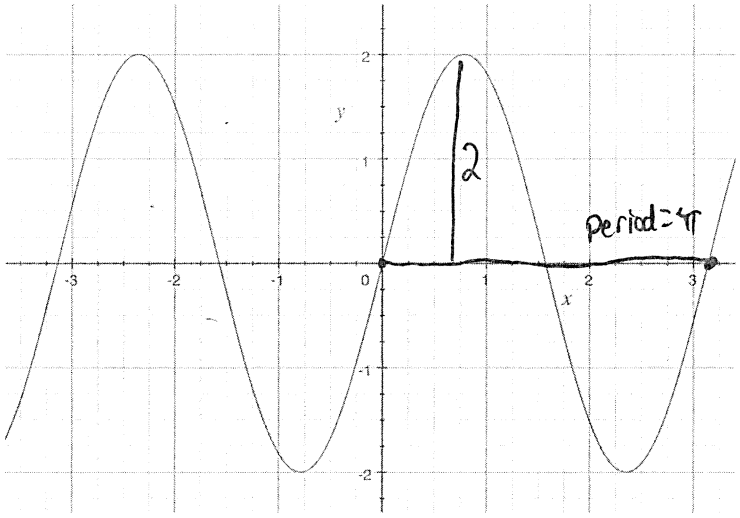
What is the highest a rider will ever get above the ground?

70 feet: $10+60=70$ ft

↑ diameter of wheel

Multiple Choice Section

1. What is the equation that could each represent the graph given below.



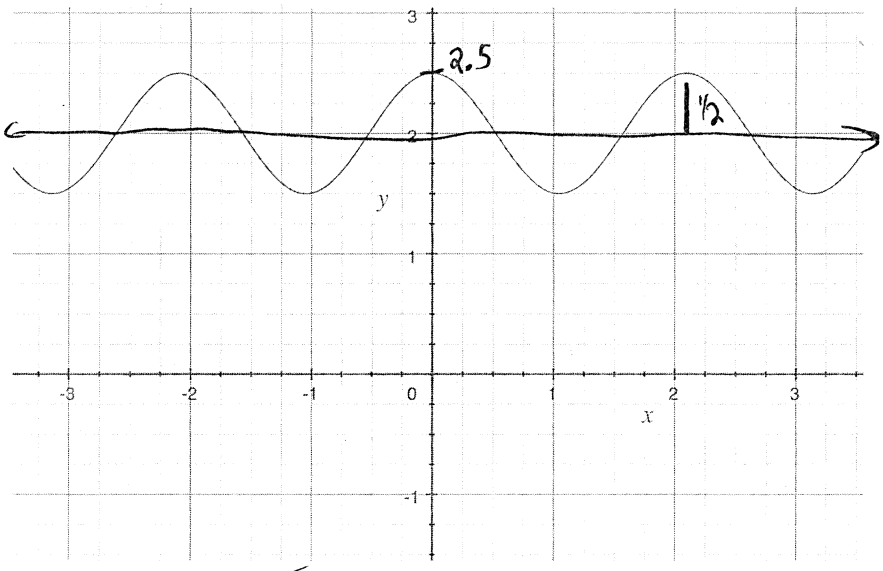
a. $y = 2\sin(2x)$ ← cos starts at top/Bottom
b. $y = 2\cos(2x)$
c. $y = 2\sin(4x)$
d. $y = 4\sin(2x)$

amp 4

$\omega = 2$

$\text{Period} = \frac{2\pi}{\omega} = \frac{2\pi}{2} = \pi = 3.14\ldots$

2. What is the midline and amplitude of the function graphed below?



midline = y = 2

a. *midline is* $y = 2$ *and amplitude is* 1
b. *midline is* $y = 2$ *and amplitude is* 2
c. *midline is* $y = 2$ *and amplitude is* 0.5
d. *midline is* $y = 1.5$ *and amplitude is* 1

3. What is the value of $\sin\left(\frac{\pi}{3}\right)$?

$\frac{\sqrt{3}}{2}$: right h.

a. $\frac{\sqrt{3}}{3}$

b. $\frac{\sqrt{2}}{2}$

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

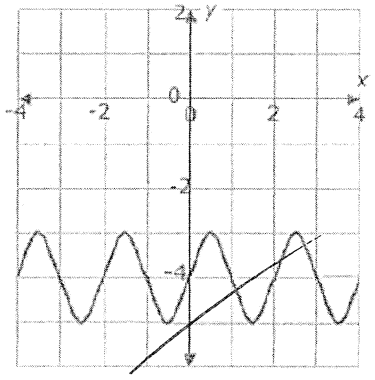
d. $\frac{\sqrt{3}}{2}$

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.

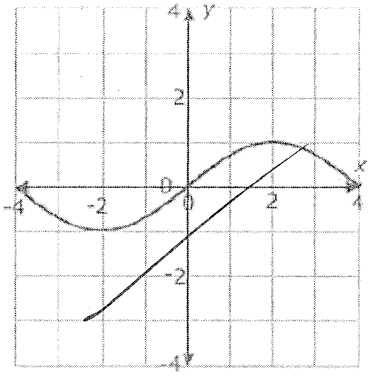
$f(x) = 4\sin(\pi x)$ Amp: 4 $\omega = \pi$ $P = \frac{2\pi}{\pi} = 2$

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

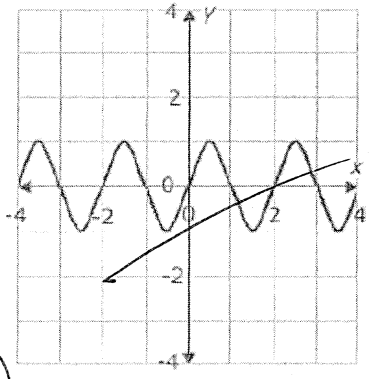
A.



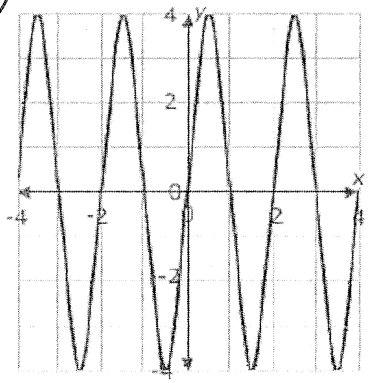
B.



C.



D.



5. What is the value of $\sin\left(\frac{7\pi}{6}\right)$?

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

$-\sin\left(\frac{\pi}{6}\right) = -\frac{1}{2}$

a. $\frac{1}{2}$

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

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

d. $\frac{-1}{2}$

End of Unit Assessment Unit 6 V1

↗ length of cycle

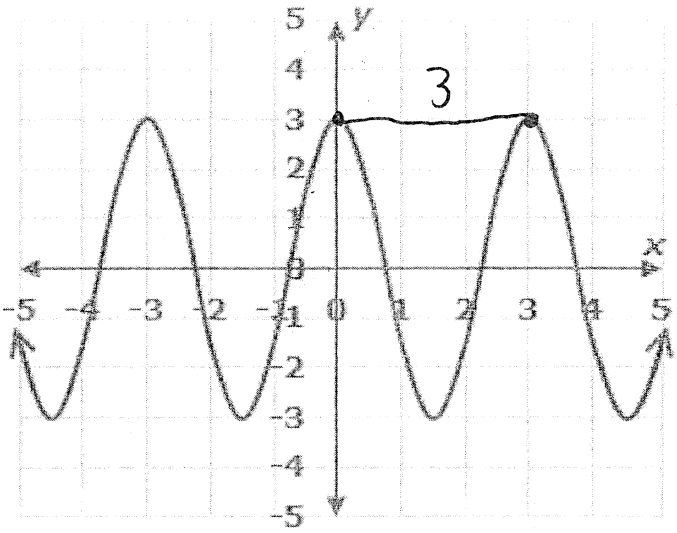
6. What is the period of the graph below?

a. 1.5

b. 3

c. 6

d. 9



7. What is the ω value for the function graphed in 6?

a. $\frac{2\pi}{3}$

b. 3

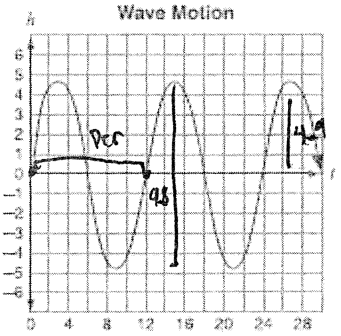
c. $\frac{\pi}{3}$

d. $\frac{2\pi}{6}$

If $p=3$

$3=\frac{2\pi}{\omega} \Rightarrow \omega=\frac{2\pi}{3}$

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.



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

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

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

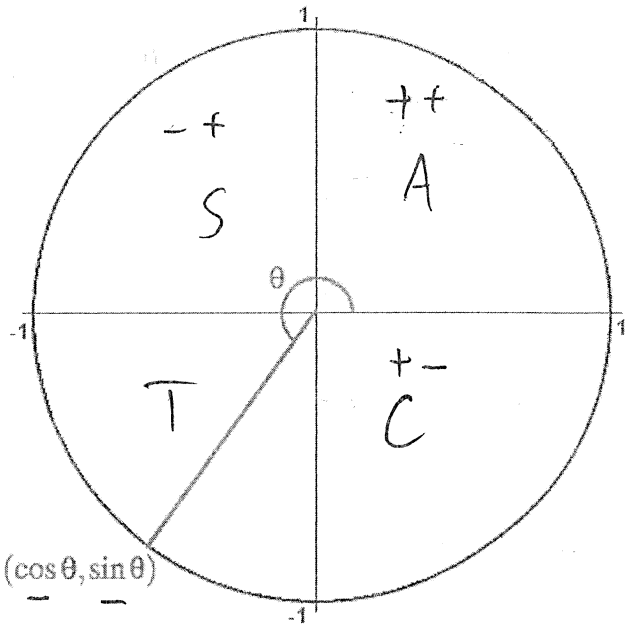
Ampis $\frac{9.8}{2}=4.9$

Per $=12$ $\quad 12=\frac{2\pi}{\omega} \Rightarrow \omega=\frac{2\pi}{12}=\frac{\pi}{6}$

$4.9\sin\left(\frac{\pi}{6}t\right)$

9. Which of the following is true for the angle graphed below? Select ALL THAT APPLY.

a. sine is positive and cosine is negative
b. sine is positive and cosine is positive
c. tangent is positive and cosine is negative
d. sine is negative and tangent is negative



10. Which of the following equations has a phase shift $\frac{\pi}{3}$ to the right?

↳ $-\frac{\pi}{3}$

a. $y = \sin(2x - \frac{\pi}{3})$
b. $y = \sin(x + \frac{\pi}{3})$
c. $y = \sin(3x - \pi)$ → $3x - \pi$
d. $y = \sin(3x + \pi)$ $3(x - \frac{\pi}{3})$

Excellence Points:

c. Find two solutions to the equation $\sin(\theta) = \cos(\theta)$.

$\theta = \frac{\pi}{4}$ or $\frac{5\pi}{4}$