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midline = $\frac{min+max}{2}$
frequency = $\frac{2\pi}{period}$

Period is ~~where~~ curve length
(where does first full cycle end from 0)
Date _____
Algebra II

Writing Equations of Sinusoidal Graphs

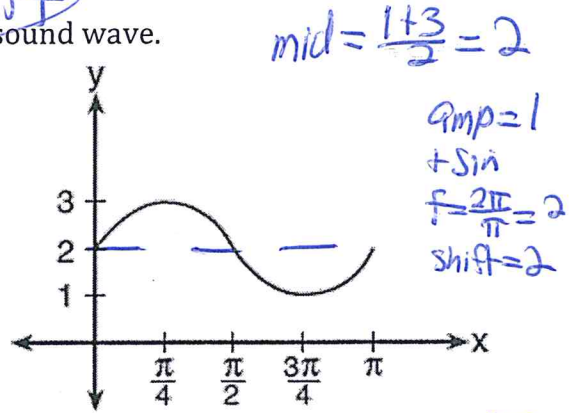
$y = \text{amp} \sin(\text{freq} \cdot x + \text{shift})$

1. The accompanying graph represents a portion of a sound wave.

Which equation best represents this graph?

- (1) $y = 2 \sin \frac{1}{2}x$ (3) $y = \sin 2x$
(2) $y = \sin \frac{1}{2}x + 2$ (4) $y = \sin 2x + 2$

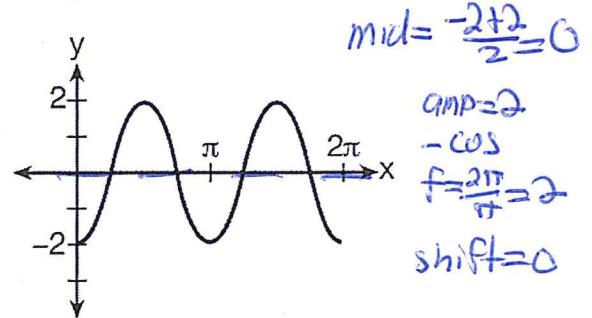
$y = \sin 2x + 2$



2. Which equation represents the graph below?

- 1) $y = -2 \sin 2x$
2) $y = -2 \sin \frac{1}{2}x$
3) $y = -2 \cos 2x$
4) $y = -2 \cos \frac{1}{2}x$

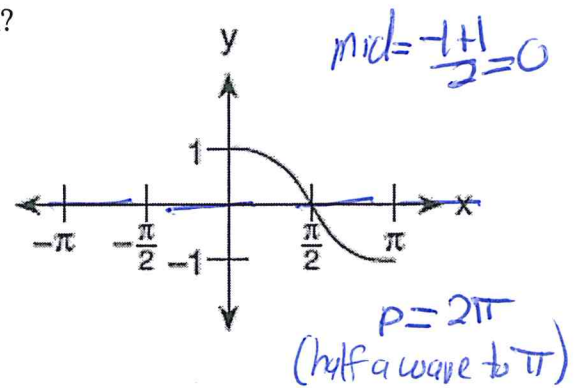
$y = -2 \cos 2x$



3. Which equation is represented by the accompanying graph?

- (1) $y = \cos x$ (3) $y = \cos 2x$
(2) $y = \cos \frac{1}{2}x$ (4) $y = \frac{1}{2} \cos x$

amp = 1
+ cos
freq = $\frac{2\pi}{2\pi} = 1$
shift = 0
 $y = \cos \frac{1}{2}x$



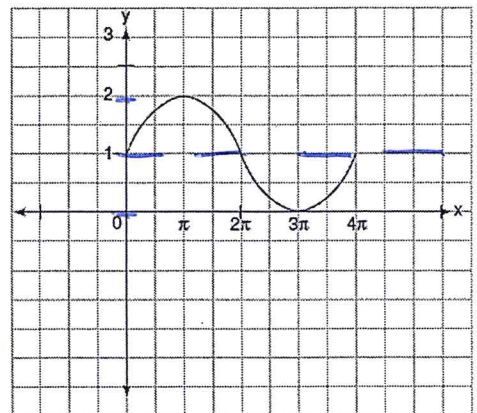
4. In physics class, Eva noticed the pattern shown in the accompanying diagram on an oscilloscope.

Which equation best represents the pattern shown on this oscilloscope?

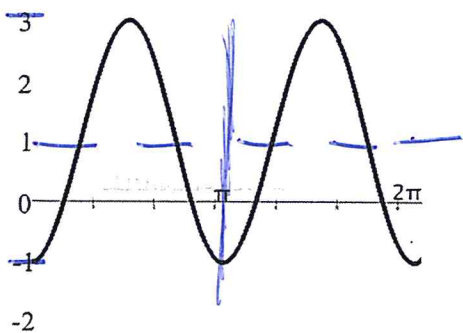
- (1) $y = \sin(\frac{1}{2}x) + 1$ (3) $y = 2 \sin x + 1$
(2) $y = \sin x + 1$ (4) $y = 2 \sin(-\frac{1}{2}x) + 1$

$y = \sin \frac{1}{2}x + 1$

mid = $\frac{0+2}{2} = 1$
amp = 1
+ sin
f = $\frac{2\pi}{4\pi} = \frac{1}{2}$
shift = 1



5. Write the equation of the sinusoidal function shown below:



$$\text{mid} = \frac{-1+3}{2} = 1$$

$$\text{amp} = 2$$

$$-\cos$$

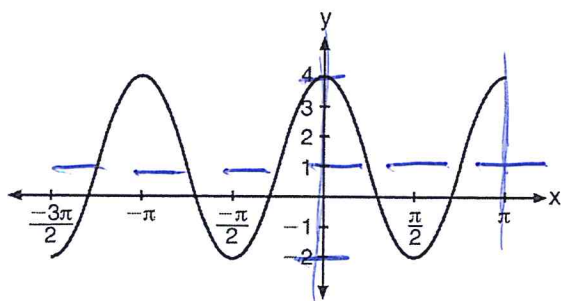
$$f = \frac{2\pi}{\pi} = 2$$

$$\text{shift} = 1$$

$$y = -2\cos 2x + 1$$

6. The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a , b , and c are real numbers.

State the values of a , b , and c , and write an equation for the graph.



$$\text{mid} = \frac{-2+4}{2} = 1$$

$$\text{amp} = 3$$

$$+\cos$$

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

$$\text{shift} = 1$$

$$y = a \cos bx + c$$

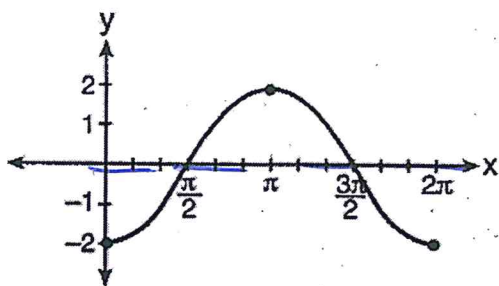
$$y = 3 \cos 2x + 1$$

$$a = 3$$

$$b = 2$$

$$c = 1$$

7. The accompanying graph shows a trigonometric function. State an equation of this function.



$$\text{mid} = \frac{-2+2}{2} = 0$$

$$\text{amp} = 2$$

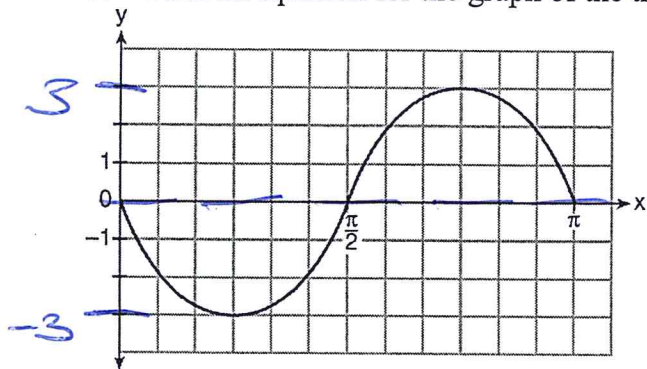
$$-\cos$$

$$\text{freq} = \frac{2\pi}{2\pi} = 1$$

$$\text{shift} = 0$$

$$y = -2 \cos x$$

8. Write an equation for the graph of the trigonometric function shown below.



$$\text{mid} = \frac{-3+3}{2} = 0$$

$$\text{amp} = 3$$

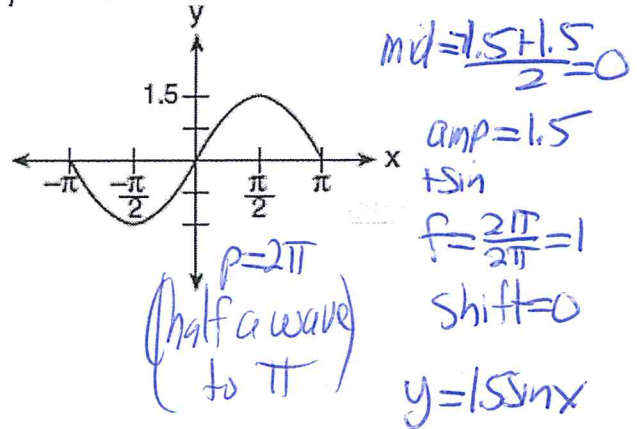
$$-\sin$$

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

$$\text{shift} = 0$$

$$y = -3 \sin 2x$$

9. A radio transmitter sends a radio wave from the top of a 50-foot tower. The wave is represented by the accompanying graph.

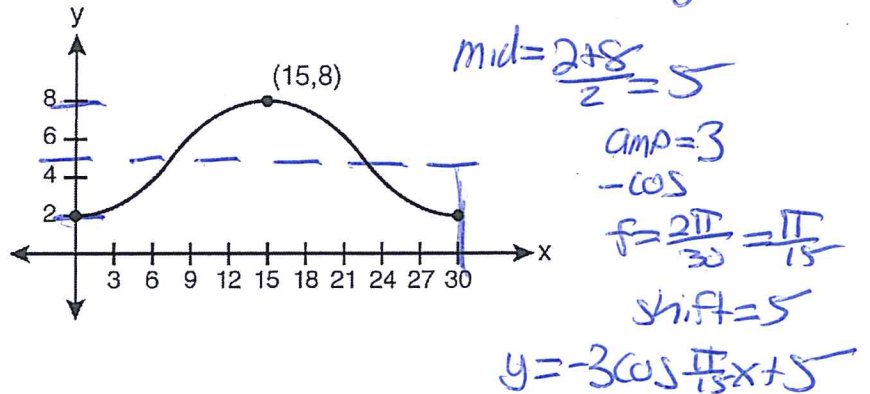


What is the equation of this radio wave?

- (1) $y = \sin x$ (3) $y = \sin 1.5x$
 (2) $y = 1.5 \sin x$ (4) $y = 2 \sin x$

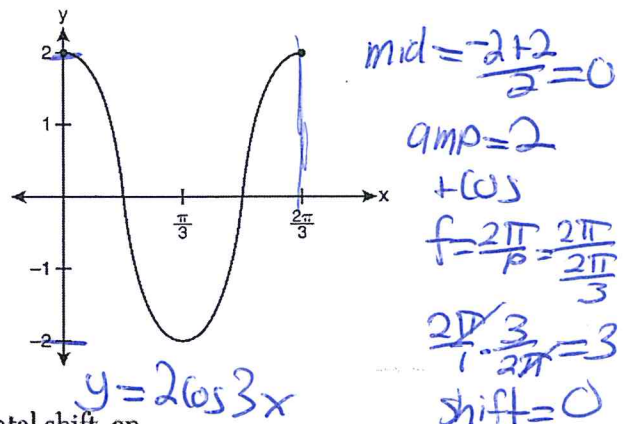
10. Which equation is graphed in the diagram below?

- 1) $y = 3 \cos\left(\frac{\pi}{30}x\right) + 8$
 2) $y = 3 \cos\left(\frac{\pi}{15}x\right) + 5$
 3) $y = -3 \cos\left(\frac{\pi}{30}x\right) + 8$
 4) $y = -3 \cos\left(\frac{\pi}{15}x\right) + 5$

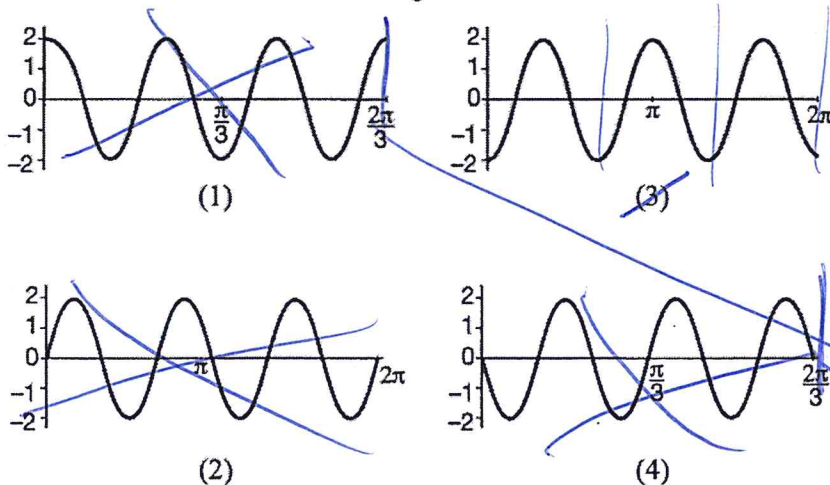


11. Which equation is represented by the graph below?

- 1) $y = 2 \cos 3x$
 2) $y = 2 \sin 3x$
 3) $y = 2 \cos \frac{2\pi}{3}x$
 4) $y = 2 \sin \frac{2\pi}{3}x$



12. Which graph represents a cosine function with no horizontal shift, an amplitude of 2, and a period of $\frac{2\pi}{3}$?



$f = \frac{2\pi}{p}$ $\frac{2\pi \cdot 3}{1 \cdot 2\pi} = 3$
 $f = \frac{2\pi}{\frac{2\pi}{3}}$ frequency is how many waves from 0 to 2π .
 3 waves to $\frac{2\pi}{3}$

Sin

$$\text{mid} = \frac{\text{min} + \text{max}}{2} \quad \text{mid} = \frac{1+5}{2} = 3$$

13. The function $f(x) = a \cos bx + c$ is plotted on the graph shown below.

$$\text{amp} = 2 \quad f = \frac{2\pi}{p} = \frac{2\pi}{\frac{\pi}{3}}$$

$$\text{Shift} = 3 \quad \frac{2\pi \cdot 3}{1 \cdot \pi} = 6$$

3) $a = 4, b = 6, c = 5$

4) $a = 4, b = \frac{\pi}{3}, c = 3$

What are the values of $a, b,$ and c ?

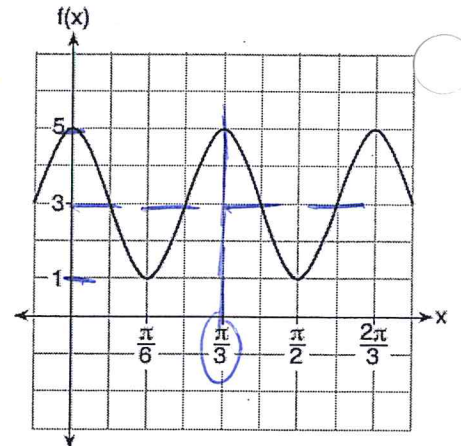
1) $a = 2, b = 6, c = 3$

2) $a = 2, b = 3, c = 1$

$$y = a \cos bx + c$$

$$y = 2 \cos 6x + 3$$

$$a = 2 \quad b = 6 \quad c = 3$$



14. The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.

If the depth, $d,$ is measured in feet and time, $t,$ is measured in hours since midnight, what is an equation for the depth of the water at the marker?

1) $d = 5 \cos\left(\frac{\pi}{6}t\right) + 9$

2) $d = 9 \cos\left(\frac{\pi}{6}t\right) + 5$

3) $d = 9 \sin\left(\frac{\pi}{6}t\right) + 5$

4) $d = 5 \sin\left(\frac{\pi}{6}t\right) + 9$

$$\text{mid} = \frac{4+14}{2} = 9$$

$$\text{amp} = 5$$

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

$$\text{Shift} = 9$$

$$y = 5 \sin \frac{\pi}{6}x + 9$$

