

**Unit 5 Test Study Guide**

1. Explain the following concepts in full-length sentences. Provide convincing arguments:

A.) Describe why amplitude is always positive.

Amplitude is always positive because amplitude measures a distance and distances are always positive values.

B.) Describe what is true about the domain of all sine and cosine functions, regardless of their transformations.

The domain is always all real numbers  $(-\infty, \infty)$  because trig. functions are periodic. This means that they continue indefinitely.

C.) Describe what properties of trigonometric functions affect the range.

The two properties that affect the range are the amplitude and the vertical shift (k-value).

2. Exploring the relationships between midline, maximums, minimums, range, and amplitude:

A.) If the midline of a trigonometric function is located at  $y = 4$  and the amplitude is 5, determine the following:

Maximum 9

Minimum -1

Range [-1, 9]

B.) If the range of a trigonometric function is  $-1 \leq y \leq 13$ , determine the following:

Maximum 13

Minimum -1

Midline  $y = 6$

Amplitude 7

3. Write a trigonometric function that has the following properties:

A.) Sine function with a midline at  $y = 7$  and a period of  $2\pi$ .

$$y = \sin(x) + 7$$

B.) Cosine function that has a range of  $-3 \leq y \leq 5$ , and is reflected over its midline.

$$y = -4 \cos(x) + 1$$

C.) Sine function that has an amplitude of  $\frac{1}{2}$ , a period of  $4\pi$  and a midline located at  $y = 1$ .

$$y = \frac{1}{2} \sin\left(\frac{1}{2}x\right) + 1$$

4. Determine the following properties from the trigonometric function:

A.)  $y = \frac{1}{2} \sin(8x - 4\pi) - 1$

Amplitude:  $\frac{1}{2}$

Midline:  $y = -1$

Period:  $\frac{\pi}{4}$

Phase Shift:  $\frac{\pi}{2}$

Domain:  $(-\infty, \infty)$

Range:  $\left[-\frac{3}{2}, -\frac{1}{2}\right]$

B.)  $y = -4 \cos\left(\frac{1}{3}x + 6\pi\right) + 2$

Amplitude: 4

Midline:  $y = 2$

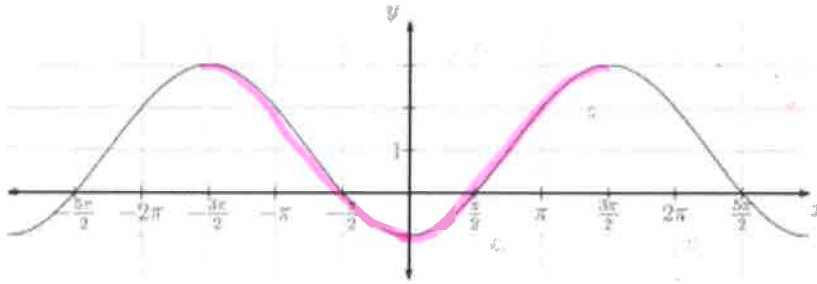
Period:  $6\pi$

Phase Shift:  $-18\pi$

Domain:  $(-\infty, \infty)$

Range:  $[-2, 6]$

5. Write an equation for a cosine function.

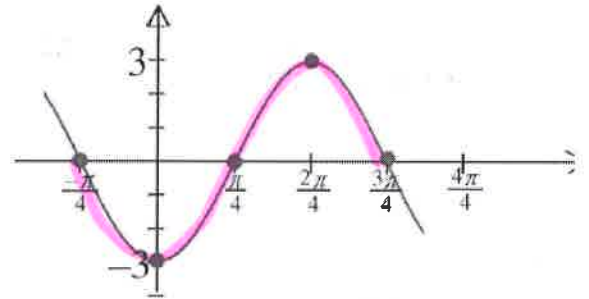


VS: 1  
amp: 2  
PS:  $-\frac{3\pi}{2}$   
Pd:  $3\pi$

$$\begin{aligned} Pd &= \frac{2\pi}{b} & PS &= \frac{-c}{b} \\ 3\pi &= \frac{2\pi}{b} & -\frac{3\pi}{2} &= \frac{-c}{2/3} \\ b &= \frac{2}{3} & -2\pi &= -2c \\ & & c &= \pi \end{aligned}$$

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

6. Write an equation for a sine function.



VS: 0  
amp: 3 \*reflected\*  
PS:  $-\frac{\pi}{4}$   
Pd:  $\pi$

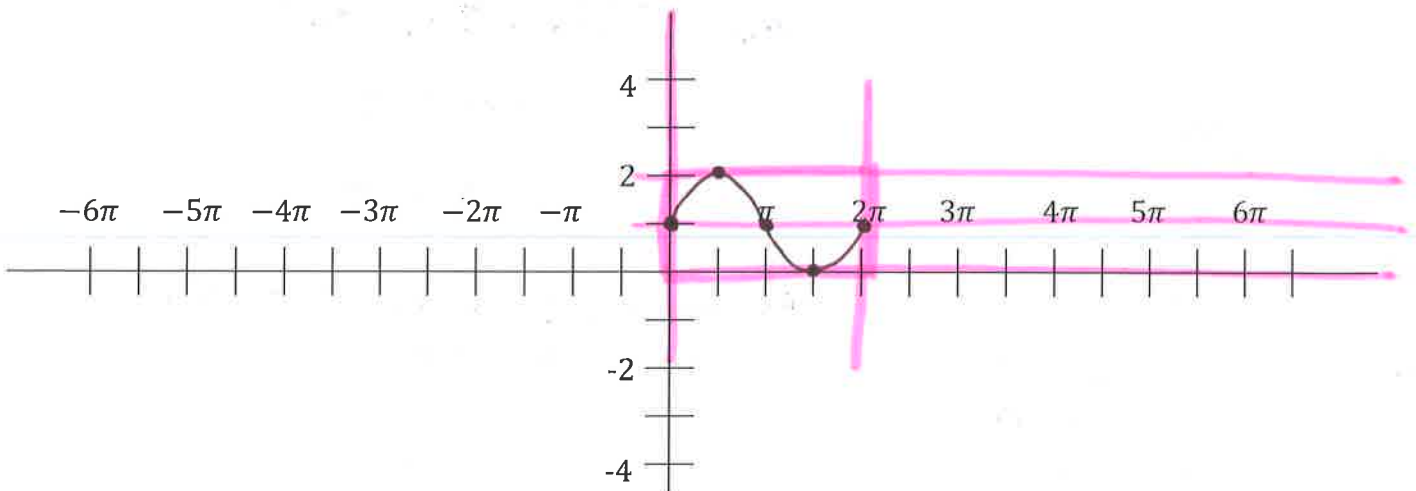
$$\begin{aligned} Pd &= \frac{2\pi}{b} & PS &= \frac{-c}{b} \\ \pi &= \frac{2\pi}{b} & -\frac{\pi}{4} &= \frac{-c}{2} \\ b &= 2 & -4c &= -2\pi \\ & & c &= \frac{\pi}{2} \end{aligned}$$

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

7. Graph the following trigonometric functions on the coordinate planes provided:

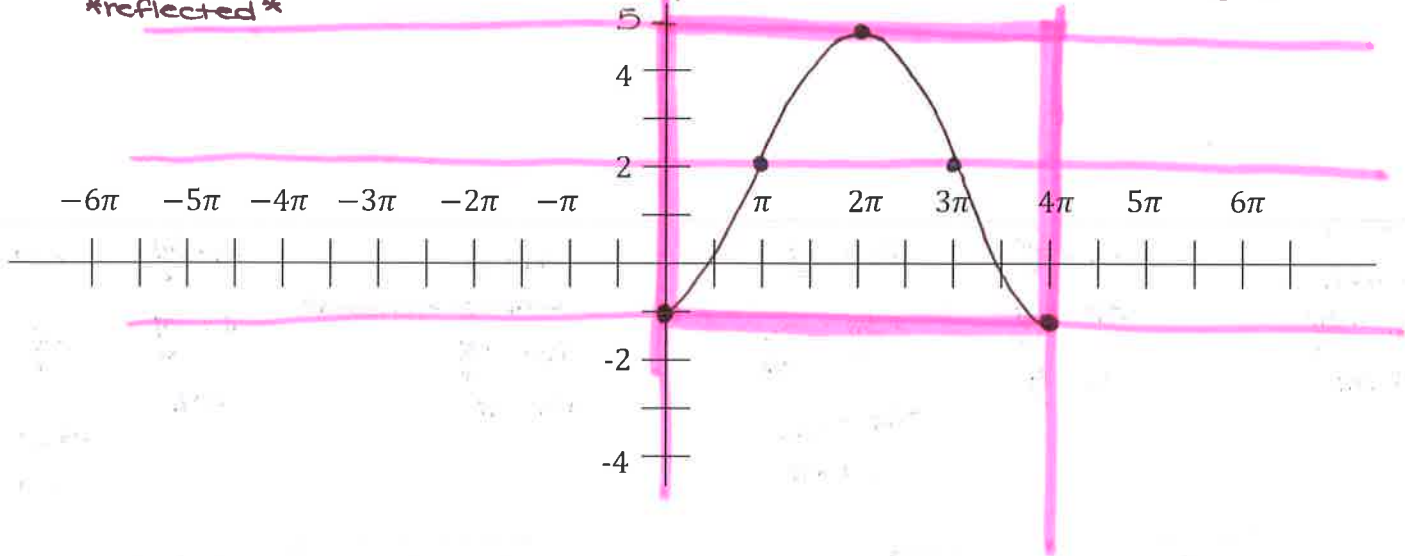
A.)  $y = \sin(x) + 1$

Amplitude: 1    Period:  $2\pi$     Midline:  $y=1$     Domain:  $(-\infty, \infty)$     Range:  $[0, 2]$



B.)  $y = -3\cos\left(\frac{1}{2}x\right) + 2$

Amplitude: 3    Period:  $4\pi$     Midline:  $y=2$     Domain:  $(-\infty, \infty)$     Range:  $[-1, 5]$   
 \*reflected\*



8. The time for one cycle is \_\_\_\_\_ ; approximately 7 hours. The high-tide depth of 16 feet occurs at noon and the average harbor depth is 11 feet.  
 (The word "midline" is written below "average harbor depth".)

(A.) Write an equation modeling this relationship. (B.) What time will the river harbor be low tide?

A.)  $y = 5 \sin\left(\frac{2\pi}{7}x\right) + 11$

$7 \text{ hrs} = \frac{2\pi}{b}$

$b = \frac{2\pi}{7}$

B.) After  $5\frac{1}{4}$  hrs the river harbor will be low tide.

