

7-6 Exploring Periodic Data

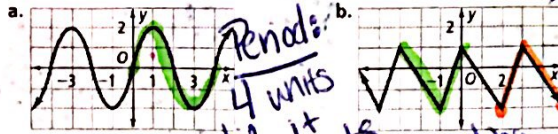
Identifying Cycles and Periods of a Function

- A periodic function is a function that repeats a pattern of y-values (or outputs) at regular intervals.
- One complete pattern is a period. A cycle may begin at any point on the graph of a function.
- The period of a function is the horizontal length of one cycle. Periodic behavior is behavior that repeats over intervals of x-values.

Example 1: Analyze the periodic function below. Identify the cycle in two different ways. What is the period of this function?



Period: 4 units!



Period: 4 units
until it starts repeating

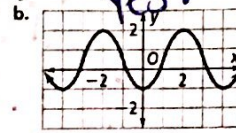
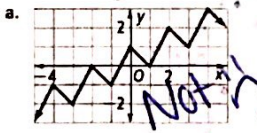
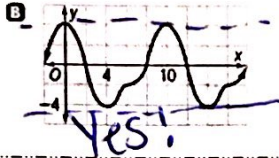
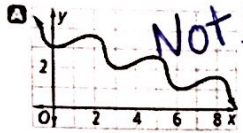
Period: 3

Identifying Periodic Functions

To determine if a function is periodic, analyze the functions graph to see if the y-values (or outputs) of the graph repeat.

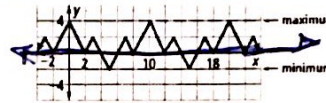
Example 2: Is the function periodic? If it is, what is its period?

You Try! Is the function periodic? If it is, what is its period?



Amplitude: The amplitude of a periodic function measures the amount of variation in the function values. The amplitude can be found by find the distance between the maximum and minimum value and dividing it by 2.

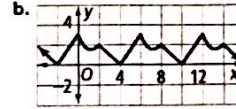
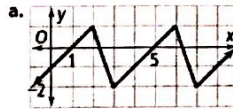
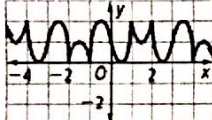
Amplitude = _____



$$4 + 2 = \frac{6}{2} = 3$$

Example 3: What is the amplitude of the periodic function below?

You Try! What is the amplitude of each periodic function?



	The Sine Function	The Cosine Function
Equation	$y = a \sin(b\theta + c) + d$	$y = a \cos(b\theta + c) + d$
Graph		

Key Ideas
$ a $ is the amplitude of the function
$\frac{2\pi}{b}$ is the number of cycles in the interval from _____ to _____
Period = $\frac{2\pi}{b}$

Phase Shift: c
Midline: d

Example 4: Find the period of the sine curve. Then write an equation for the function.

Period = 2π Amplitude = 2 $a = 2$ $b = 1$

Equation: $y = 2 \sin \theta$

You Try! Find the period of the sine curve. Then write an equation for the function.

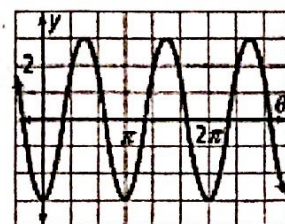
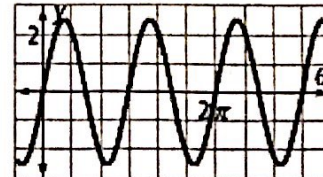
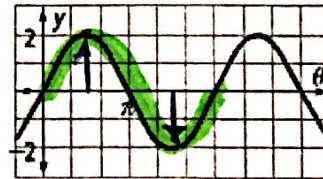
Period = Amplitude = $a =$ $b =$

Equation:

Example 5: Find the period of the cosine curve. Then write an equation for the function.

Period = Amplitude = $a =$ $b =$

Equation:



$$y = a \sin(b\theta + c) + d$$

↑ vertical stretch/compress (Amplitude)
 ↑ moves left/right
 ↑ (Phase shift)
 ← (midline) moves up/down

horizontal stretch/compress (Period: $\frac{2\pi}{b}$)

Ex 1

$$y = -2 \cos 4x + 7$$

Amplitude: $|-2| = 2$

Phase Shift: 0

Period: $\frac{2\pi}{4} \rightarrow \frac{\pi}{2}$

midline: 7

Ex 2

$$f(x) = \frac{1}{2} \sin(x-3) - 5$$

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

Phase Shift: 3

Period: $\frac{2\pi}{1} \rightarrow 2\pi$

midline: -5