Monday, May 4, 2020

Periodic Functions and their graphs

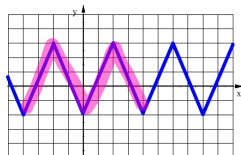Periodic function: A function with a pattern of y-values that repeat at regular intervals.

Cycle: One complete pattern.
The smallest portion of the function that could be translated left and right to create the entire function.

Period: The width of one cycle (x-values)
It's how often y-values repeat.

A cycle of a periodic function.

Even though this highlighted portion could create the whole graph if it is translated left and right, it is NOT a cycle of this graph because there is a smaller portion of the graph that could be repeated in order to create the whole graph.
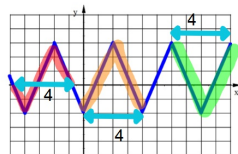
The three highlighted portions of the graph are all examples of a cycle of this graph.
Notice that they all have the same width (4 units).

Find the Period of this Periodic Function.
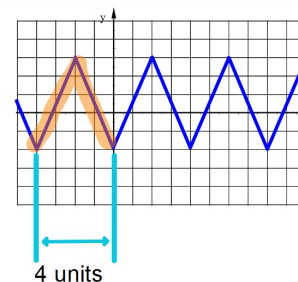
Period = width of 1 cycle

Period = 4

4 units

Maximum of a Periodic Function:

The largest y-value or the highest point on the graph.

Minimum of a Periodic Function:

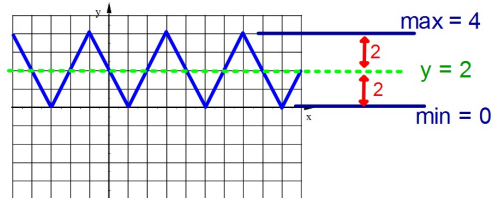The smallest y-value or the lowest point on the graph.

Midline:
The horizontal line that passes through the middle of the graph.

or

The horizontal line halfway between the max and the min.

Always a $y =$ equation

State the equation of the Midline of this periodic function.

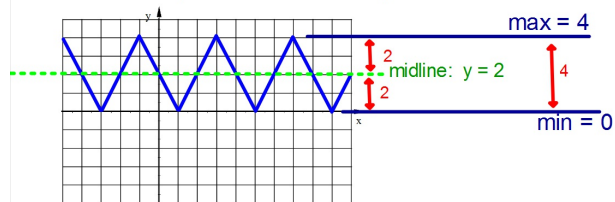max = 4

2

$y = 2$

2

min = 0

Amplitude:
The vertical distance from the midline to either the maximum or the minimum.   (y-values)
OR
Half the total height of the periodic function

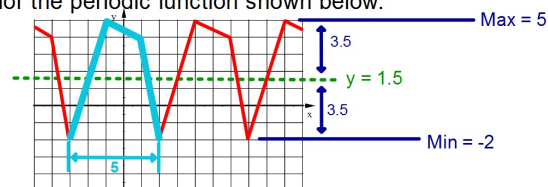State the amplitude of this same periodic function.

max = 4

2

midline: y = 2

2

4

min = 0

Amplitude = 2

Midline (Axis): $y = \dfrac{Max + Min}{2}$

Amplitude $= \dfrac{Max - Min}{2}$

Find the Period, Amplitude, and Equation of the Midline for the periodic function shown below.

Max = 5

3.5

y = 1.5

3.5

Min = -2

5

Eq of Midline: y= 1.5

$\dfrac{max + min}{2} = \dfrac{5 + (-2)}{2}$
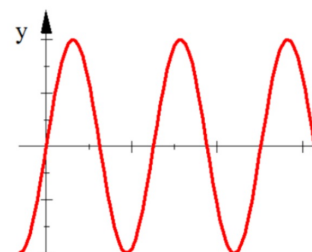
$= \dfrac{3}{2} = 1.5$

Amplitude = 3.5

$\dfrac{max - min}{2} = \dfrac{5 - (-2)}{2}$
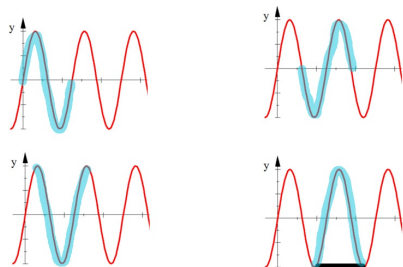
$= \dfrac{7}{2} = 3.5$

Period = 5

With of 1 cycle = 5

You will be working with lots of graphs that look like the one below, therefore, we'll focus on those now.

These graphs will have a cycle that takes on one of the four following shapes:
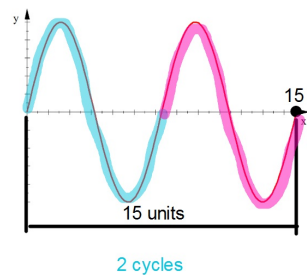

Each of these is a full cycle:

Each of the shaded sections represents 1/4 of a cycle.

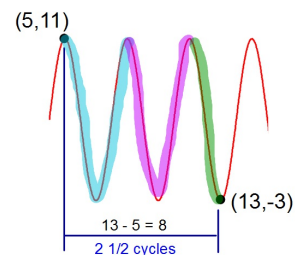
Find the period of each periodic function.

Period = width of one cycle

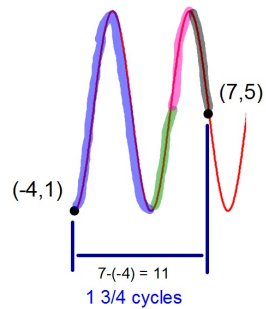$$\text{Period} = \frac{\text{Total width}}{\text{\# of cycles}}$$

$$\text{Period} = \boxed{\frac{15}{2}}$$

15 units

2 cycles

Sometimes all we'll have to work with are some coordinates. From those we should be able to find the Period.

(5,11)

(13,-3)

13 - 5 = 8

2 1/2 cycles

$$\text{Period} = \frac{\text{Total width}}{\text{\# of cycles}}$$

$$\text{Period} = \frac{8}{2\frac{1}{2}} = \frac{8}{\frac{5}{2}}$$

$$= 8 \cdot \frac{2}{5} = \boxed{\frac{16}{5}}$$

$$\text{Period} = \frac{\text{Total width}}{\text{\# of cycles}}$$

$$\text{Period} = \frac{11}{1\frac{3}{4}} = \frac{11}{\frac{7}{4}}$$

$$= 11 \cdot \frac{4}{7} = \boxed{\frac{44}{7}}$$

You can now finish the first part of Practice #24.

We will finish this material tomorrow at which time you can finish the remainder of the practice.

Practice #24 will be due on Thursday, May 7 by 10:00pm