Sec 13-1: Periodic Functions

Periodic function: A repeating pattern of y-values 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)

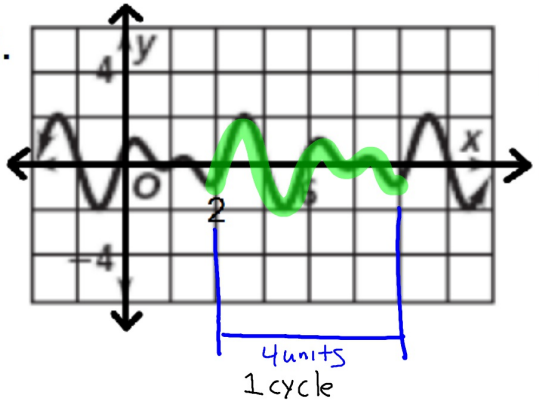
Midline (also called the Axis):
The horizontal line that passes through the middle of the graph.

Equations will be: y =

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

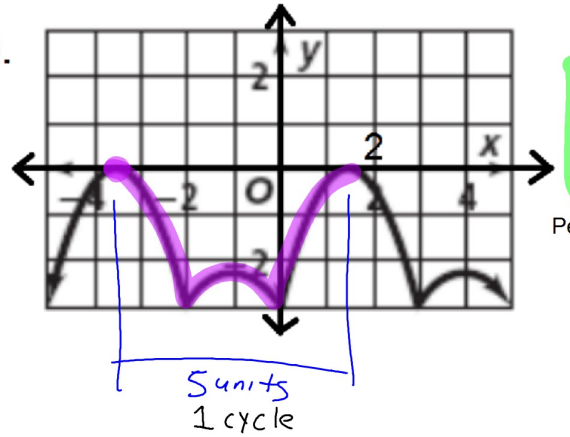
2. Highlight one cycle of each periodic function and find it's period.

a.



Period = width of 1 cycle

b.

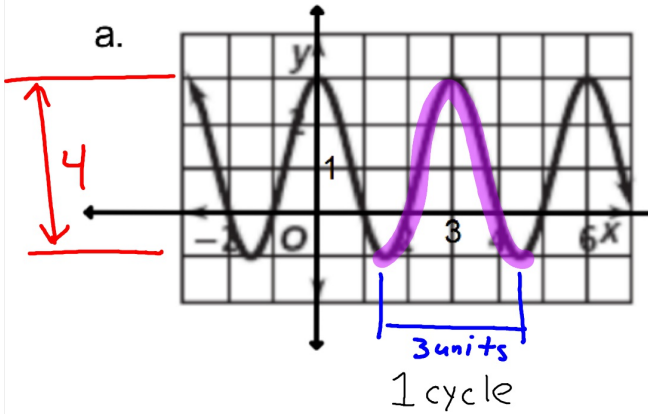


Period = 5

Period = width of 1 cycle

3. Find the period, amplitude, and equation of the midline for each periodic function.

a.



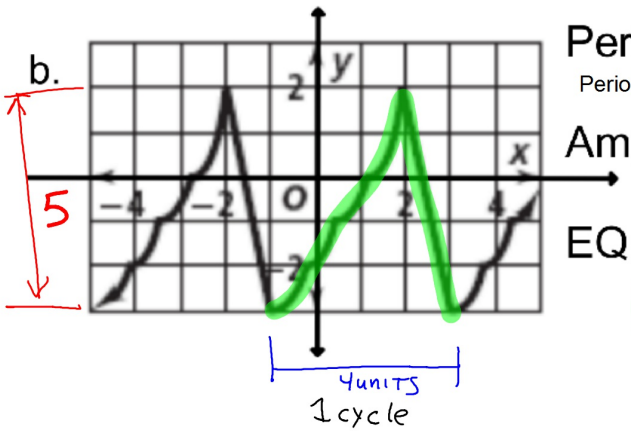
Period = 3

Period = width of 1 cycle

Amplitude = $\frac{4}{2} = 2$

EQ of Midline: $y = 1$

b.



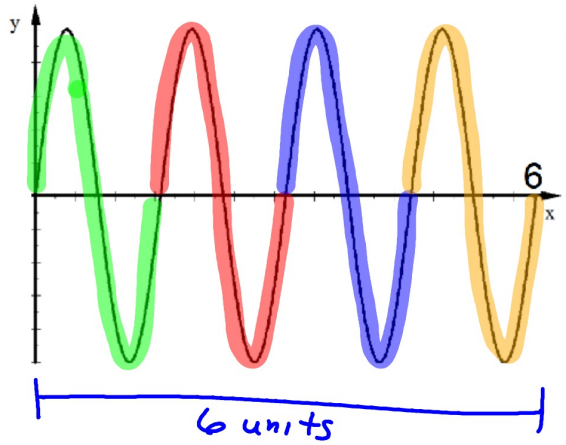
Period = 4

Period = width of 1 cycle

Amplitude = $\frac{5}{2} = 2.5$

EQ of Midline: $y = -0.5$

4. Find the period of this periodic function.



4 cycles

$\text{period} = \frac{\text{total distance}}{\#\text{ cycles}}$

$= \frac{6 \text{ units}}{4 \text{ cycles}}$

period = $\frac{3}{2}$

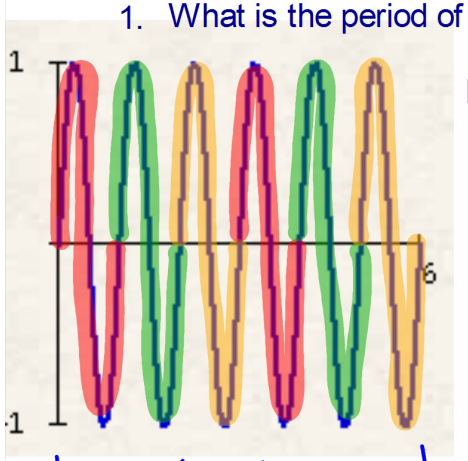
If you can't tell by looking at the graph, this is how you find the Midline and Amplitude mathematically.

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

Amplitude = $\frac{Max - Min}{2}$ = half the total height

Max and Min are the y-coordinates of the highest and lowest points on the graph.

1. What is the period of this function?



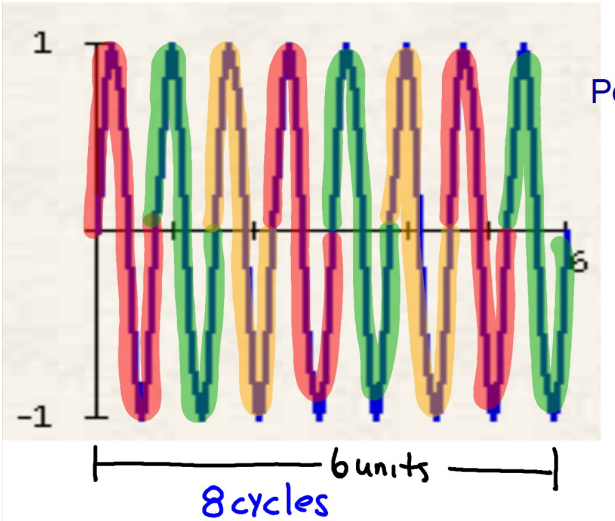
Period = $\frac{\text{Total Distance}}{\#\text{cycles}}$

$= \frac{6 \text{ units}}{6 \text{ cycles}}$

Period = 1

Period = width of 1 cycle

2. What is the period of this function?



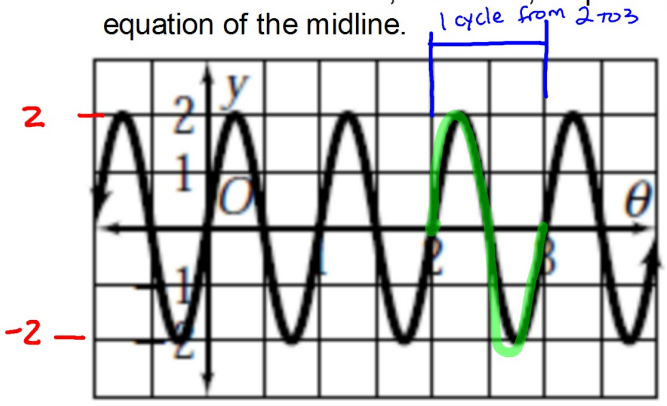
Period = $\frac{\text{Total Distance}}{\#\text{cycles}}$

$= \frac{6 \text{ units}}{8 \text{ cycles}}$

Period = 3/4

Period = width of 1 cycle

3. Find the Maximum, Minimum, amplitude, period, and equation of the midline.



each box on x-axis = 1/2 unit

Max: 2

Min: -2

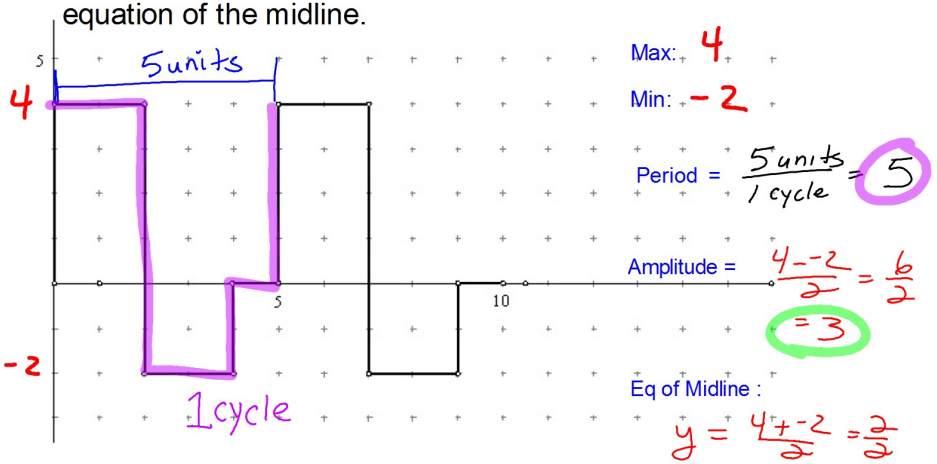
Period = 1

Amplitude = $\frac{2 - -2}{2} = \frac{4}{2} = 2$

Eq. of Midline: $y = \frac{2 + -2}{2} = \frac{0}{2}$

y = 0

4. Find the Maximum, Minimum, amplitude, period, and equation of the midline.



Max: 4

Min: -2

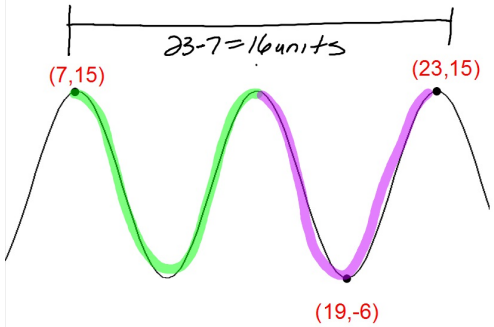
Period = $\frac{5 \text{ units}}{1 \text{ cycle}} = 5$

Amplitude = $\frac{4 - -2}{2} = \frac{6}{2} = 3$

Eq of Midline : $y = \frac{4 + -2}{2} = \frac{2}{2}$

$y = 1$

Find the amplitude, period, and equation of the midline.



max = 15

min = -6

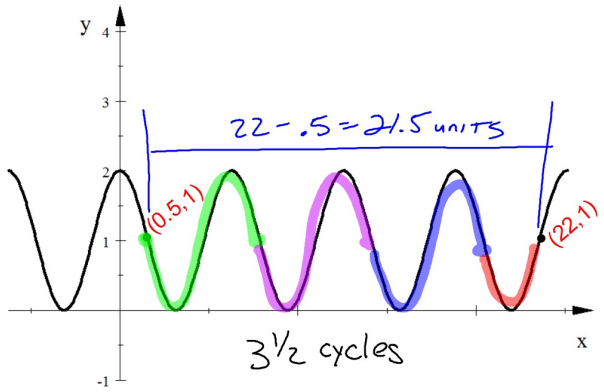
Period = $\frac{16 \text{ units}}{2 \text{ cycles}} = 8$

Period = width of 1 cycle

Amplitude = $\frac{15 - -6}{2} = \frac{21}{2} = 10.5$

Eq of Midline : $y = \frac{15 + -6}{2} = \frac{9}{2}$

$y = 4.5$



max = 2

min = 0

Period = $\frac{21.5 \text{ units}}{3.5 \text{ cycles}} = \frac{43}{7}$

Amplitude = $\frac{2 - 0}{2} = \frac{2}{2} = 1$

Eq of Midline : $y = \frac{2 + 0}{2} = \frac{2}{2}$

$y = 1$