Thursday, April 16, 2020

Sec 7-4: Periodic Functions and their graphs

Periodic function: Pattern of y-values that repeat at regular intervals.

Cycle: 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: The horizontal line that passes through the middle of the graph. (y = equation)

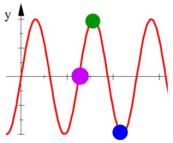
Amplitude: Half the total height of the periodic function. (y-values)

Formulas for Midline and Amplitude:

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

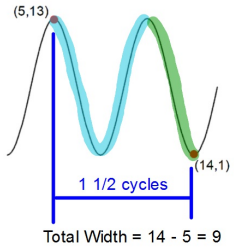
Amplitude = $\frac{Max - Min}{2}$ = half the total height

You will be working with lots of graphs that look like the one below. But you won't always have the origin to work with.



For the following graphs the coordinates given will either represent a max, a min, or a point on the midline.

Find the Period:

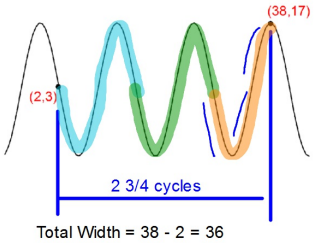


$$\text{Period} = \frac{\text{total width}}{\#\text{ cycles}} = \frac{9}{1\frac{1}{2}}$$

$$= \frac{9}{\frac{3}{2}} = 9 \cdot \frac{2}{3} = 6$$

Period = 6

Find the Period:

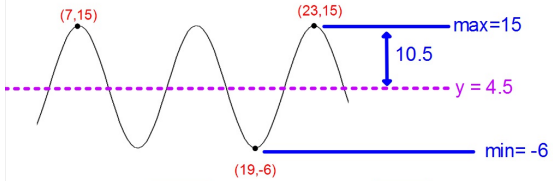


$$\text{Period} = \frac{\text{total width}}{\#\text{ cycles}} = \frac{36}{2\frac{3}{4}}$$

$$= \frac{36}{\frac{11}{4}} = 36 \cdot \frac{4}{11} = \frac{144}{11}$$

Period = $\frac{144}{11}$

Find the Midline, Amplitude, and Period.

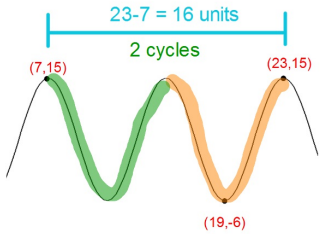


Eq of Midline : y=4.5 $y = \frac{15 + (-6)}{2} = \frac{9}{2} = 4.5$

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

Period : See next page

Find the Midline, Amplitude, and Period.

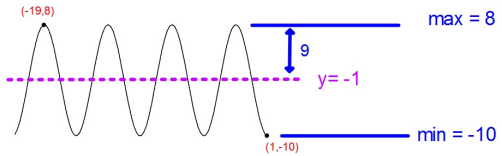


$$\text{Period} = \frac{\text{total width}}{\#\text{ cycles}}$$

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

Period = 8

Find the Amplitude, Midline, and Period:



Amplitude = 9

$= \frac{\max - \min}{2} = \frac{8-(-10)}{2}$

$= \frac{18}{2} = 9$

Eq of Midline : y= -1

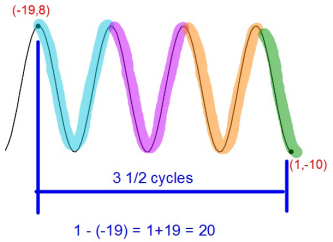
$y = \frac{\max + \min}{2}$

$= \frac{8+(-10)}{2} = \frac{-2}{2} = -1$

Period

See next page.

Find the Period:



Period = $\frac{\text{total width}}{\text{\# cycles}} = \frac{20}{3\frac{1}{2}}$

$= \frac{20}{\frac{7}{2}} = 20 \cdot \frac{2}{7} = \frac{40}{7}$

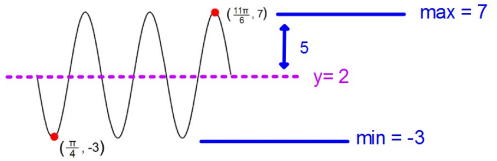
Period = $\frac{40}{7}$

As we continue most x-coordinates will be in terms of π.

And like we've been doing we will only be dealing with points that are located at:

max's, a min's, or points on the midline.

Find the Midline, Amplitude, and Period.



Eq of Midline :

$y = \frac{\max + \min}{2}$

$= \frac{7+(-3)}{2} = \frac{4}{2} = 2$

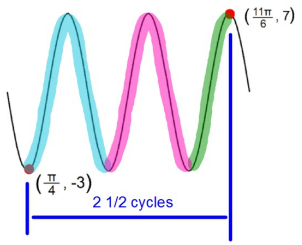
Amplitude = 5

$\frac{\max - \min}{2} = \frac{7-(-3)}{2}$

$= \frac{10}{2} = 5$

Period:

See next page

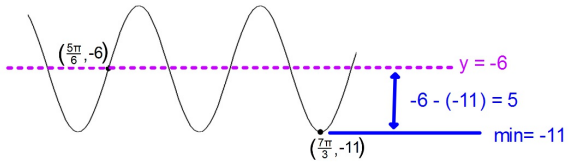


Period: $\frac{\text{total width}}{\text{\# cycles}} = \frac{\frac{19\pi}{12}}{2\frac{1}{2}}$

$= \frac{\frac{19\pi}{12}}{\frac{5}{2}} = \frac{19\pi}{12} \cdot \frac{2}{5} = \frac{19\pi}{30}$

Period = $\boxed{\frac{19\pi}{30}}$

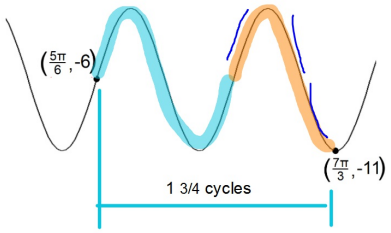
Total Width = $\frac{11\pi}{6} - \frac{\pi}{4} = \frac{22\pi}{12} - \frac{3\pi}{12} = \frac{19\pi}{12}$



Eq of Midline : y= -6
No calculating to do since $(\frac{5\pi}{6}, -6)$ is on the midline.

Amplitude = 5
Distance from midline to minimum

Period:
See next page.



Total width = $\frac{7\pi}{3} - \frac{5\pi}{6} = \frac{14\pi}{6} - \frac{5\pi}{6} = \frac{9\pi}{6} = \boxed{\frac{3\pi}{2}}$

Period: $\frac{\text{total width}}{\text{\# cycles}}$

$= \frac{\frac{3\pi}{2} \text{ units}}{1\frac{3}{4} \text{ cycles}}$

$= \frac{\frac{3\pi}{2}}{\frac{7}{4}} = \frac{3\pi}{2} \cdot \frac{4}{7}$

Period = $\boxed{\frac{6\pi}{7}}$

You can now do Practice #17 which is posted on my blog.