Pre-Calculus II: Graded Worksheet: Week #3

Due on April 23, 2022 at 11:59pm

Professor P. Haberman

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Problem 1

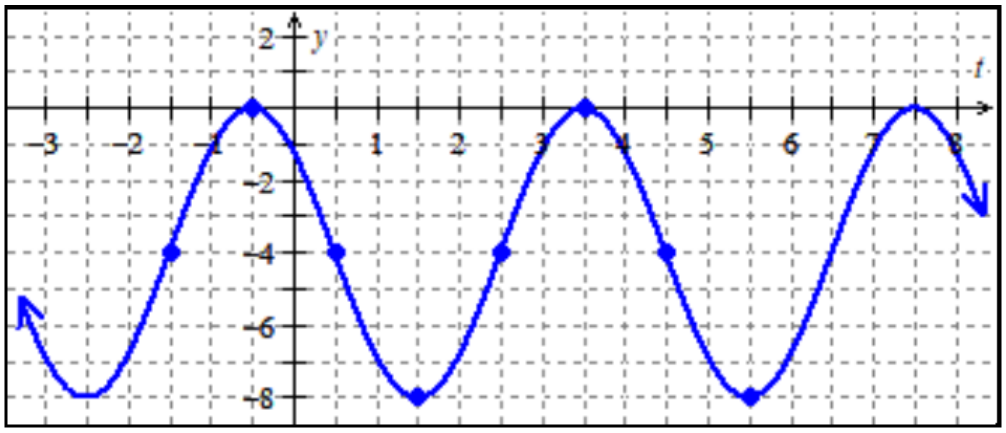

Figure 1

- Use the ***sine function*** to construct an algebraic rule (i.e., a "formula") for the function f graphed in Figure 1. [4 **points**]
- Use the ***cosine function*** to construct an algebraic rule (i.e., a "formula") for the function f graphed in Figure 1. [4 **points**]

Solution 1

$$y = A\sin(\omega(t-h)) + k \text{ or } y = A\cos(\omega(t-h)) + k$$

.

Where:

$$\begin{gathered}\text{midline: } y = k \\ \text{amplitude: } |\, A \,| \\ \text{period: } \tfrac{2\pi}{|\omega|} \\ \text{horizontal shift: } h \text{ units} \\ \text{angular frequency: } \omega \text{ radians per unit of } t\end{gathered}$$

When we look at the graph, we can tell that the midline is -4. Also, if you want to make sure, you do the following: $\frac{f_{\max}+f_{\min}}{2}$

To find the amplitude, we look at the midline and count how many units it takes to get to either the minimum or maximum. So, our amplitude is 4.

To get the period, you can go either maximum to maximum or minimum to minimum, which is 4. Now, we solve for ω.

$$\frac{2\pi}{\omega} = 4 \Rightarrow \omega = \frac{\pi}{2}$$

.

I don't really understand how we would get h, but I'm guessing you would use 2.5 for sin and for cos would be $\frac{1}{2}$.

Here's the final equation:

$$y = 4\sin\left(\frac{\pi}{2}(t-2.5)\right) - 4 \text{ and } y = 4\cos\left(\frac{\pi}{2}(t-0.5)\right) - 4$$

.

Problem 2

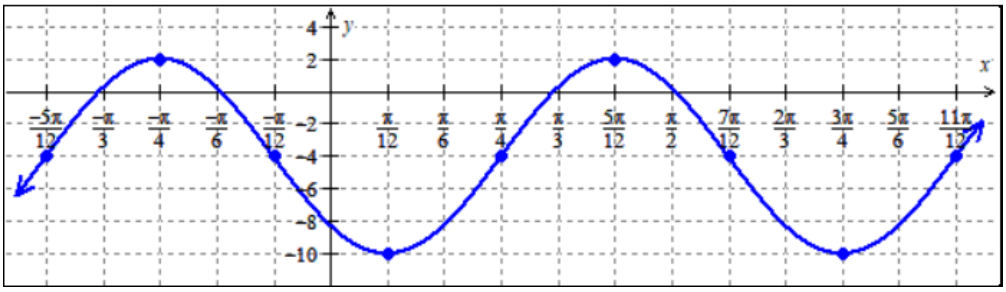

Figure 2

- Use the ***sine function*** to construct an algebraic rule (i.e., a "formula") for the sinusoidal function g graphed in figure 2. [4 **points**]
- Use the ***cosine function*** to construct an algebraic rule (i.e., a "formula") for the sinusoidal function g graphed in figure 2. [4 **points**]

Solution 2

$$y = A\sin(\omega(t-h)) + k \text{ or } y = A\cos(\omega(t-h)) + k$$

.
Where:

$$\begin{gathered}\text{midline: } y = k \\ \text{amplitude: } |\, A \,| \\ \text{period: } \tfrac{2\pi}{|\omega|} \\ \text{horizontal shift: } h \text{ units} \\ \text{angular frequency: } \omega \text{ radians per unit of } t\end{gathered}$$

When we look at the graph, we can tell that the midline is -4. Also, if you want to make sure, you do the following: $\frac{f_{\max}+f_{\min}}{2}$
To find the amplitude, we look at the midline and count how many units it takes to get to either the minimum or maximum. So, our amplitude is 4.
To get the period, you can go either maximum to maximum or minimum to minimum, which is $\frac{2\pi}{3}$. Now, we solve for ω.

$$\frac{2\pi}{\omega} = \frac{2\pi}{3} \Rightarrow \omega = 3$$

.
I don't really understand how we would get h, but I'm guessing you would use $\frac{\pi}{4}$ for sin and for cos would be $\frac{7\pi}{12}$.
Here's the final equation:

$$y = 4\sin\left(3\left(t-\frac{\pi}{4}\right)\right) - 4 \text{ and } y = 4\cos\left(3\left(t-\frac{7\pi}{12}\right)\right) - 4$$

.

Problem 3

Draw a graph of at least two periods of the function $F(x) = 4\sin\left(2x - \frac{\pi}{2}\right) + 2$ by

- plotting the points where the graph intersects the midline
- plotting the points where the graph achieves maximum and minimum values
- connecting these points with an appropriately curved sinusoidal wave.

Draw an **accurate** graph and **label** the scale on the axes. [4 **points**]

Solution 3

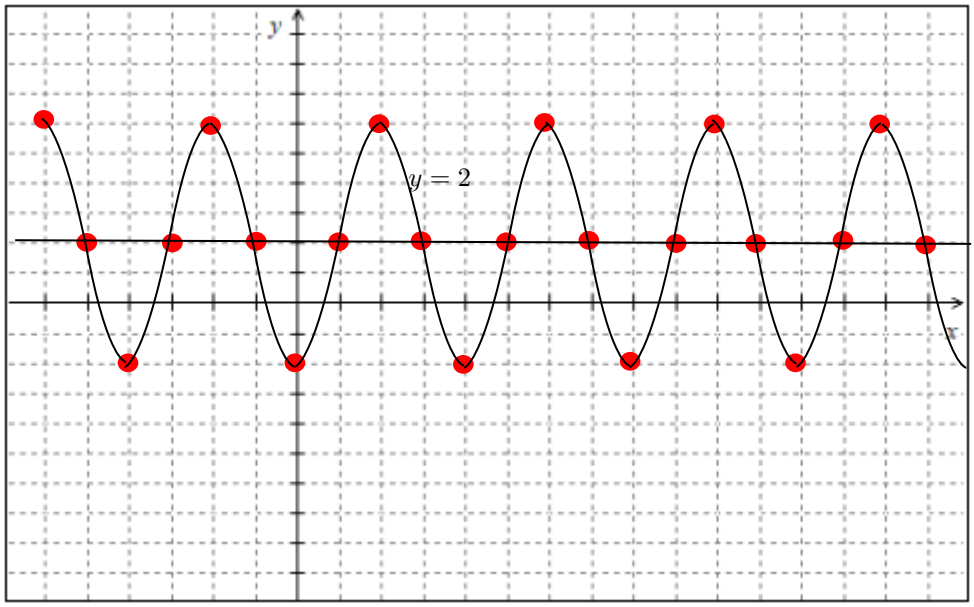

Figure 3