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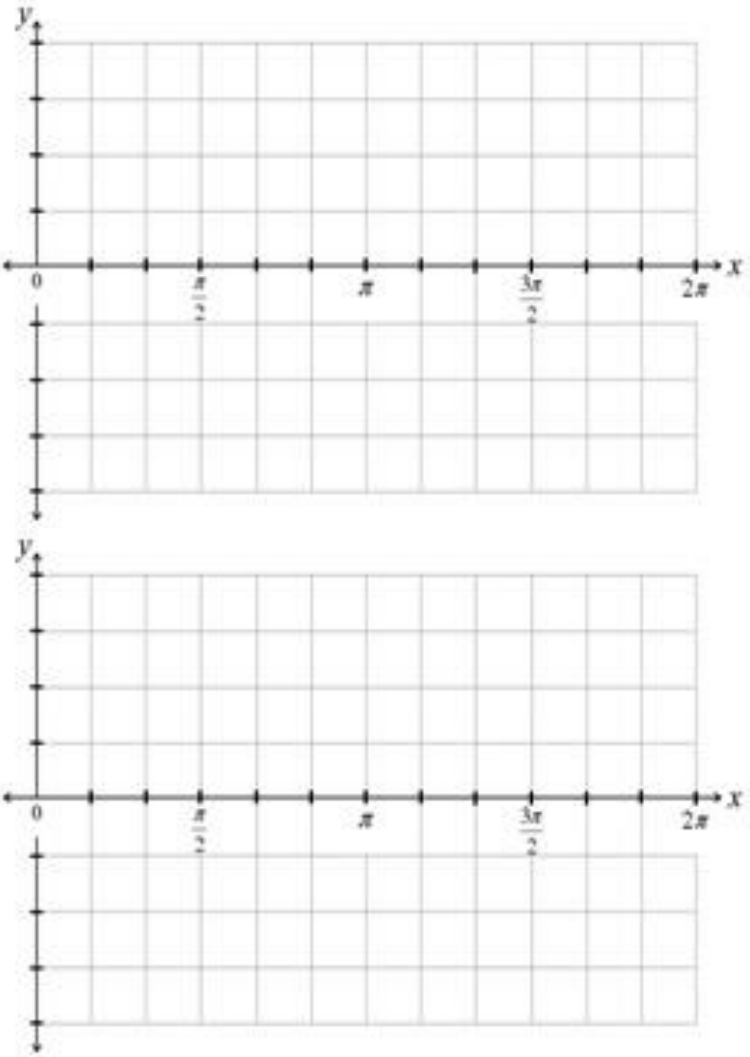
4.05 – Do Now **Binder Section: DN**

Do Now

1. Complete the tables of values for the functions $f(x) = \sin x$ and $g(x) = \cos x$ below.

x	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$f(x) = \sin x$												
$g(x) = \cos x$												

2. Graph and label the functions $f(x) = \sin x$ and $g(x) = \cos x$ accurately on the grids provided. Use the key to the right to approximate values when plotting points.



Key

Exact Value	Approximate Value
$\frac{1}{2}$	0.5
$\frac{\sqrt{2}}{2}$	0.707
$\frac{\sqrt{3}}{2}$	0.866

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4.05 – Explore **Binder Section: EX**

Explore!

1. Using the graphs from the Do Now:

   a) What makes the graphs of f and g similar? What properties do f and g have in common?

   b) What properties do the graphs of f and g not share?

2. The graphs of $f(x) = \sin x$ and $g(x) = \cos x$ are called sinusoids and resemble waves. All sinusoids have:

   a) An **amplitude** – the distance between the center line of a sinusoid and its peak, or maximum value; also the distance between the center line of a sinusoid and its trough, or minimum value.

   b) A **period** – the distance between two peaks of a sinusoid and the distance it takes for a cycle of the graph to repeat.

   What are the periods and amplitudes of $f(x) = \sin x$ and $g(x) = \cos x$? Annotate the graphs from the Do Now to justify your answer.

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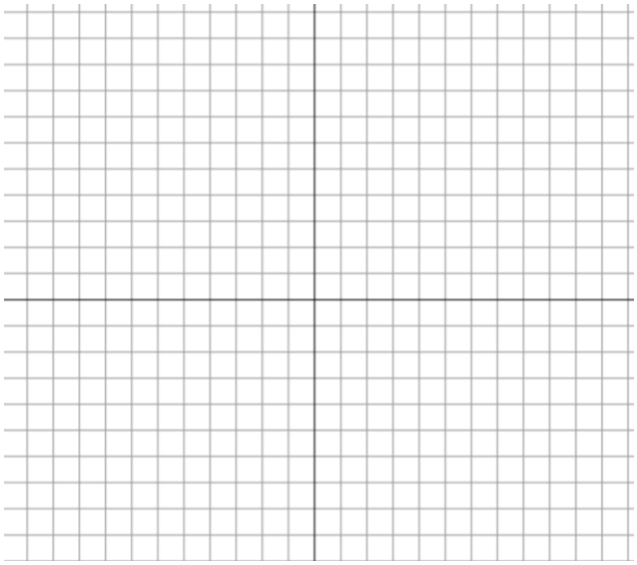
4.05 –Class Notes **Binder Section: CN**

Teacher Note

This is not a student facing notes page. Students should be using their Pre-AP Calculus notebook to capture their "I Do" and "We Do" Example

Example 1

1. Graph the function $f(x) = 4\sin\left(\frac{\pi}{6}x\right) + 2$ on the grid provided. In order to receive full credit, your graph should include:



a) The correct location of intercepts and extrema
b) The correct midline, amplitude, and period
c) At least two complete cycles

Example 2

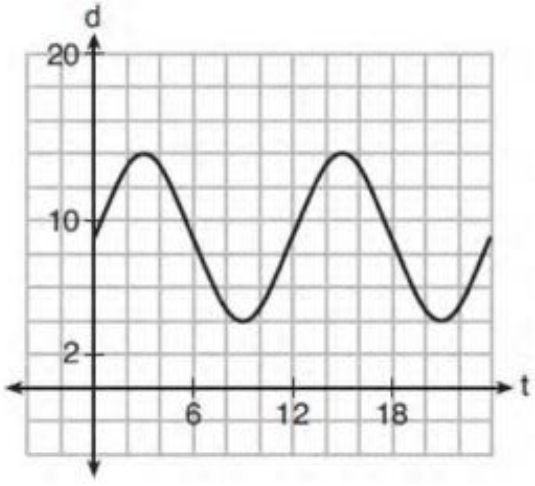
2. The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below. If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is an equation for the depth of the water at the marker?

(A) $d = 5\cos\left(\frac{\pi}{6}t\right) + 9$

(B) $d = 9\cos\left(\frac{\pi}{6}t\right) + 5$

(C) $d = 9\sin\left(\frac{\pi}{6}t\right) + 5$

(D) $d = 5\sin\left(\frac{\pi}{6}t\right) + 9$



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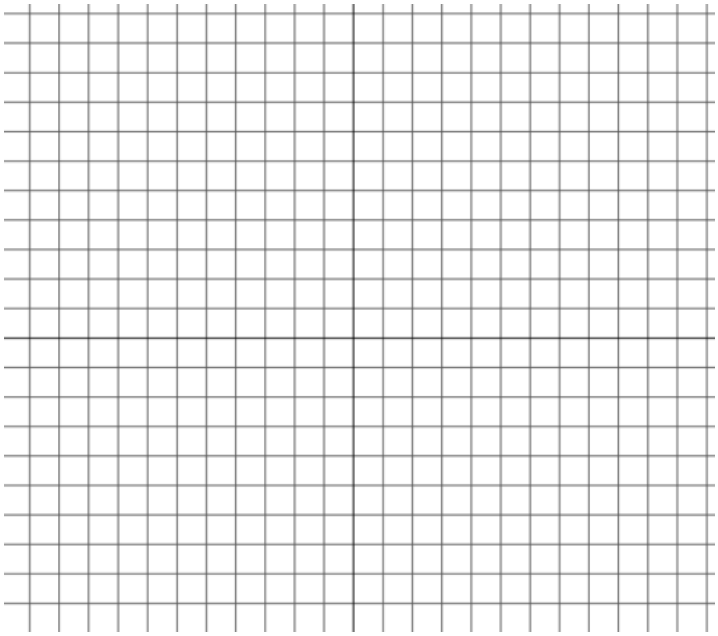
4.05 – Classwork **Binder Section: CW**

Problem Set A

1. Consider the function $f(x) = -5\sin\left(\frac{\pi x}{4}\right) - 2$:
   a. State the amplitude and the equation of the midline of $f(x)$.

   b. Find the (x, y) coordinates of the left and right endpoints.

   c. Plot the left and right endpoints. Plot the midpoint. Then, plot the other two key points. Label the coordinates of all five key points.



   d. State the period of $f(x)$ and show how you got it.

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4.05 – Classwork **Binder Section: CW**

Problem Set B

1. What is the amplitude and period of $f(x) = -2\cos(3x)$?

   (A) The amplitude is 4 and the period is $\frac{2\pi}{3}$.

   (B) The amplitude is 2 and the period is $\frac{3\pi}{2}$.

   (C) The amplitude is -2 and the period is $\frac{3\pi}{2}$.

   (D) The amplitude is 2 and the period is $\frac{2\pi}{3}$.

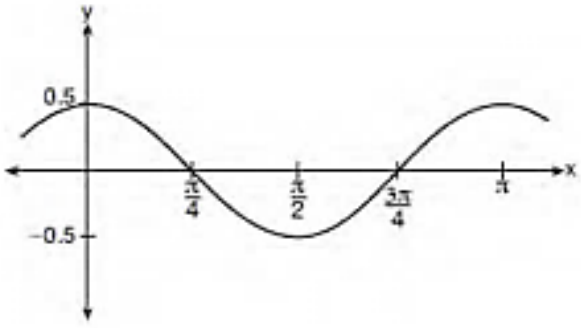
2. Which equation is represented by the graph shown to the right?

   (A) $y = \frac{1}{2}\cos 2x$

   (B) $y = \cos x$

   (C) $y = \frac{1}{2}\cos x$

   (D) $y = 2\cos\frac{1}{2}x$



3. The voltage used by most households can be modeled by a sinusoid. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where t is time in seconds?

   (A) $V = 120\sin t$

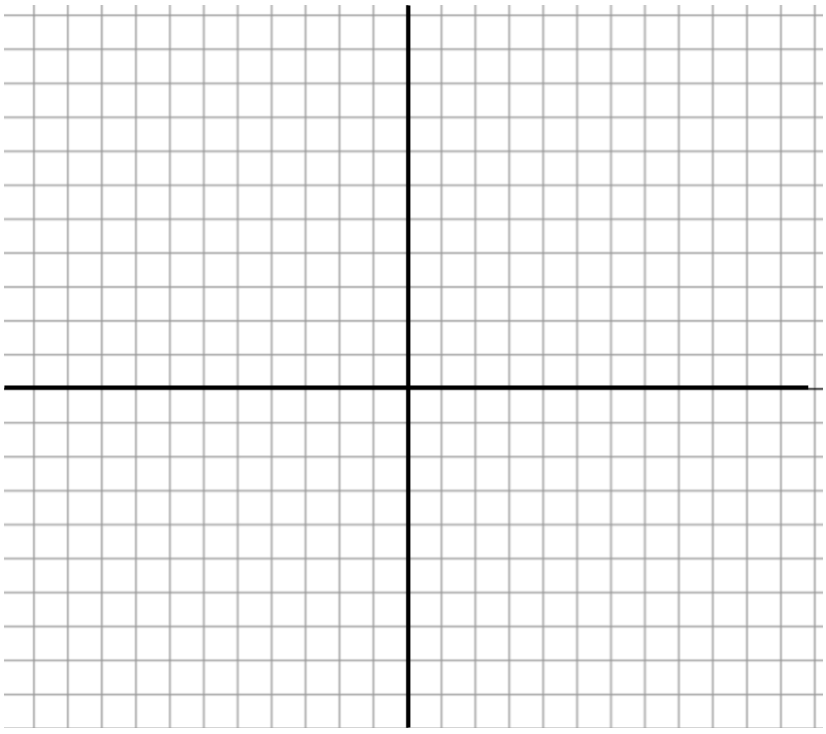
   (B) $V = 120\sin(60t)$

   (C) $V = 120\sin(60\pi t)$

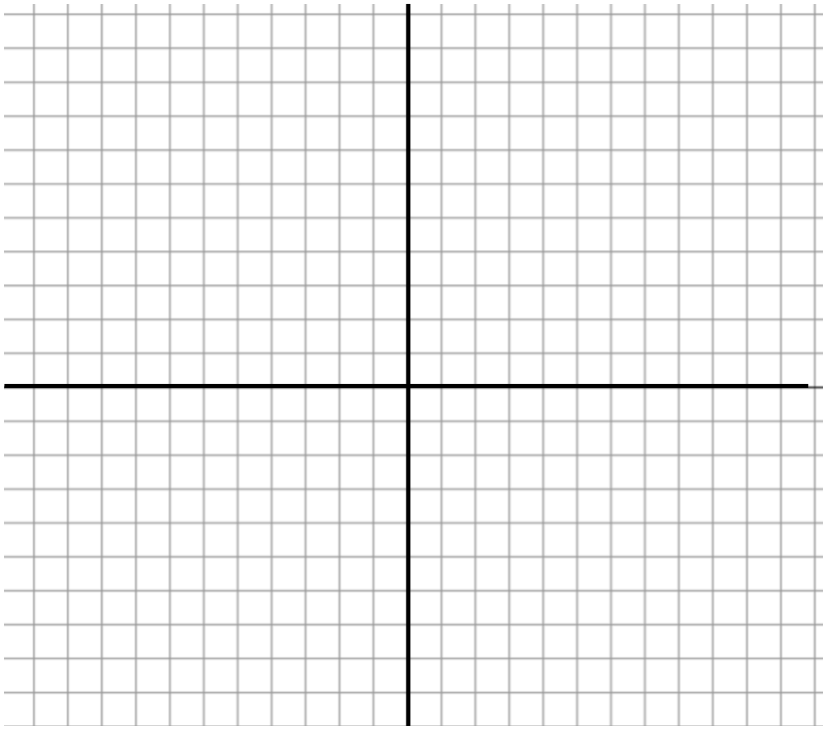
   (D) $V = 120\sin(120\pi t)$

A. **Directions**: Graph each sinusoid below using the method from example 1. Label the 5 key points, midline, amplitude, and period.

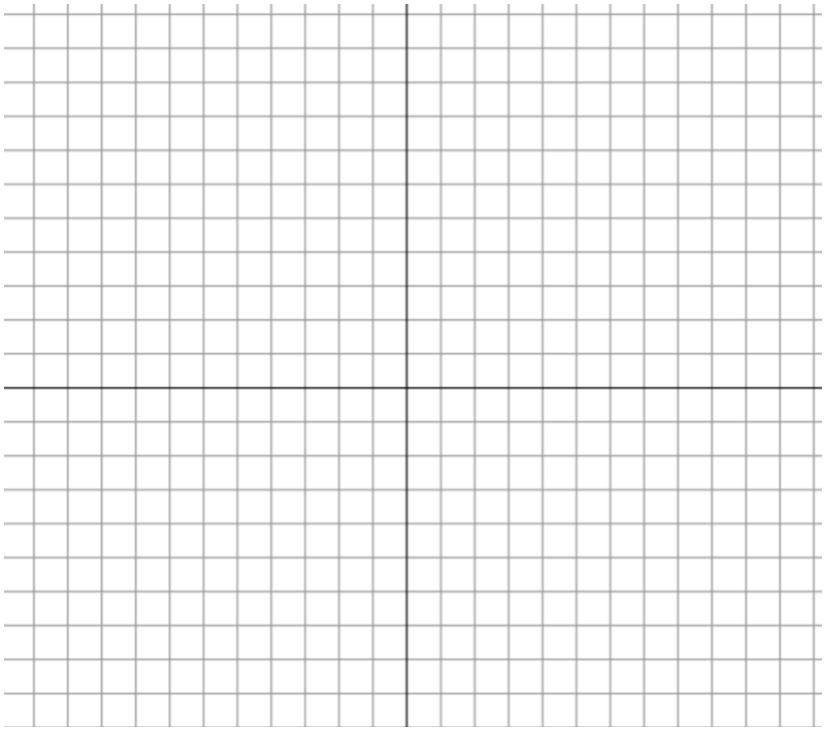
4. $f(x) = 4\sin\left(\frac{\pi}{8}x\right) - 4$



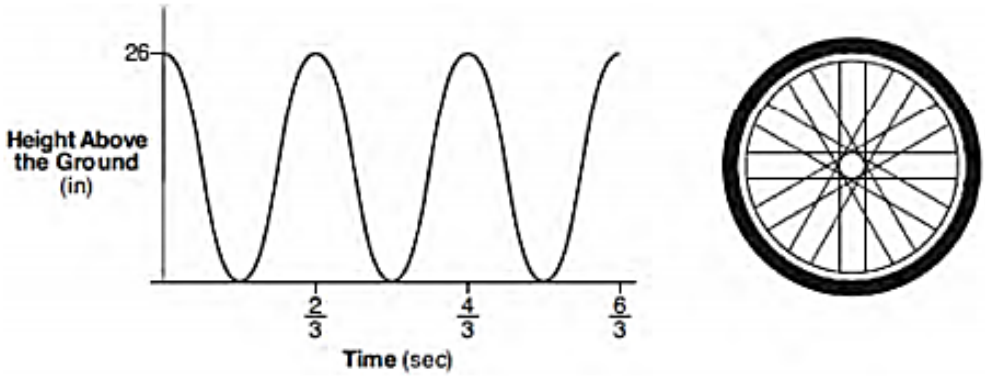
5. $f(x) = 6\sin\left(\frac{\pi}{5}x\right) - 3$



6. $f(x) = 5\cos\left(\frac{\pi x}{4}\right) - 4$



7. The graph below represents the height above the ground, h, in inches, of a point on a triathlete's bike wheel during a training ride in terms of time, t, in seconds.



a) Identify the amplitude and period of this graph.

b) Describe what the period represents in the context of this problem.

Fast Workers! Nice Job working through Problem Set A and Problem Set B. Keep the math fresh by working through these spiral problems below.

Polynomial Identities!

1. If $(x + 3y)^2 = x^2 + 9y^2 + 42$, what is the value of x^2y^2?

2. Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

3. If $(x - y)^2 - 2(x^2 - y^2) = (x - y)^a(bx + cy)$, find the values of a, b, and c. Show all steps neatly and write your final answer in the space provided.

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4.05 – Exit Ticket **Binder Section: ET**

1. In 1-2 sentences, explain (a) what the period of a sinusoid represents, and (b) how to find it.

2. Graph the sinusoid $f(x) = 3\sin\left(\frac{\pi}{3}x\right) - 2$ on the grid provided. In order to receive full credit, your graph should include:
   a) The correct location of intercepts and extrema
   b) The correct midline, amplitude, and period
   c) At least two complete cycles