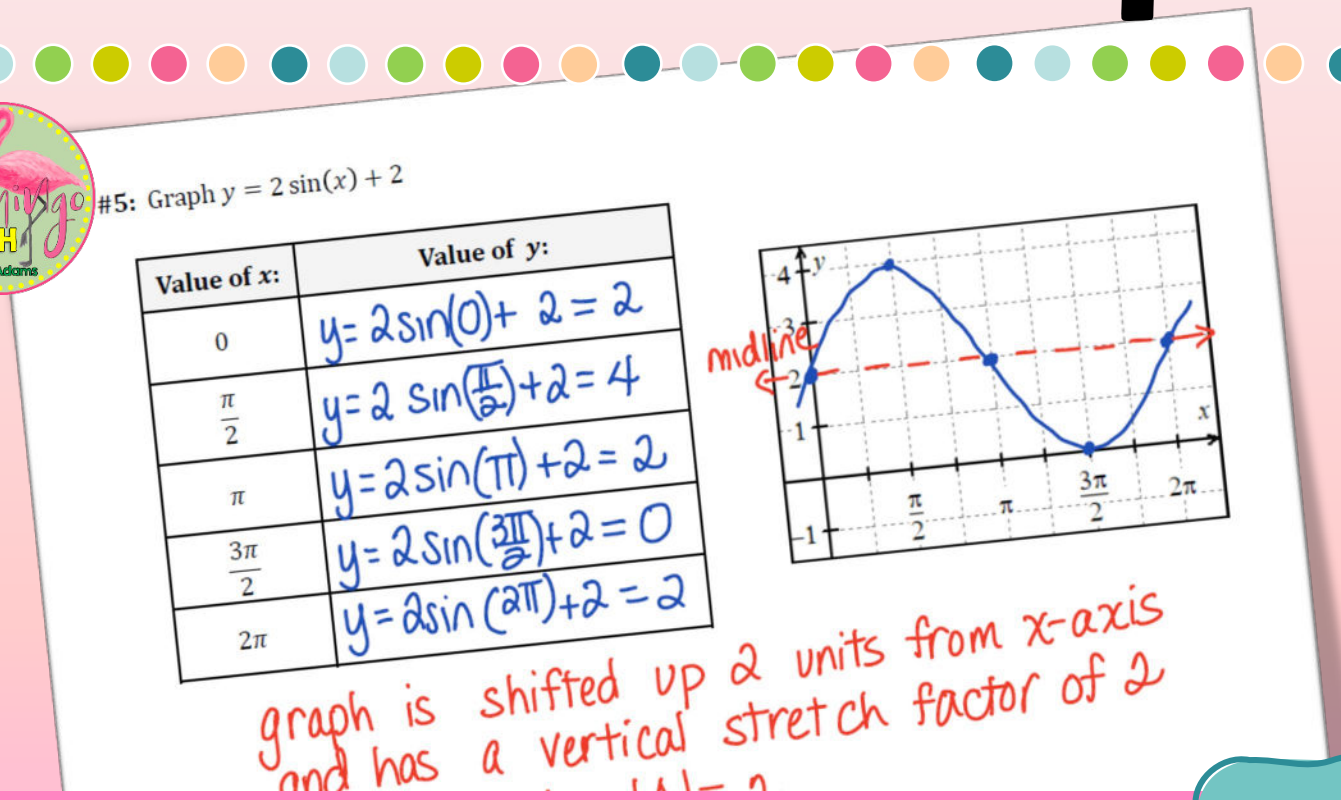
AP® Precalculus

Sine and Cosine Function Graphs



Flamingo MATH Jean Adams

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3.4

Lesson 4-A: Sine and Cosine Function Graphs

The sine and cosine functions relate real number values to the x- and y-coordinates of a point on the unit circle. What would this look like if we created a graph relating the angle and the function value? Let's begin with that relationship in order to visualize the unit circle in a two-dimensional graph.

Vocabulary

Sine function	matches the measure of an angle in standard position with the y-coordinate of a point on the unit circle. This point is where the terminal side of the angle intersects the unit circle.
Sine curve	the graph of a sine function
Sine of θ	the y-coordinate of the point at which the terminal side of the angle intersects the unit circle.

The Graph of $y = \sin x$

EX #1: Since the period of the sine function is 2π, we will graph the function on the interval $[0, 2\pi]$.

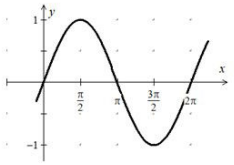
A. Make a table of values (x, y) on $y = \sin x$ from the unit circle.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
$y = \sin x$													

To sketch the graphs of the basic sine and cosine curves by hand, it helps to know the ***five key points*** in one period of the parent function. Key points are named: the *intercepts*, the *maximum points*, and the *minimum points*. These points will be divided up into quarter intervals. Let's begin with the graph of the sine function.

The Graph of $y = \sin x$

EX #2: Use the table of values from example 1 to label the five key points for the parent function.



Key Properties of Sine Functions

$y = A\ \sin(Bx)$, with $a \neq 0$, $b > 0$, x in radians

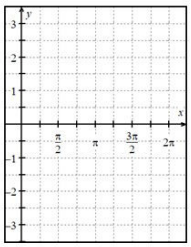
Domain: Range:

Amplitude: Period:

Graphing Variations of $y = \sin x$

EX #4: Use the five key points of the parent function to graph $y = -3\sin(2x)$.

Value of x:	Value of y:
0	
$\frac{\pi}{2}$	
π	
$\frac{3\pi}{2}$	
2π	



EX #5: Graph $y = 2\sin(x) + 2$

Lesson 4-B: Sine and Cosine Function Graphs

You should now have a good understanding of the process for finding the five key points of the sine function. This same concept will work for the cosine curve, let's establish this parent function using the same approach.

Vocabulary

Cosine function	matches the measure of an angle in standard position with the x-coordinate of a point on the unit circle. This point is where the terminal side of the angle intersects the unit circle.
Cosine curve	the graph of a cosine function
Cosine of θ	the x-coordinate of the point at which the terminal side of the angle intersects the unit circle.

The Graph of $y = \cos x$

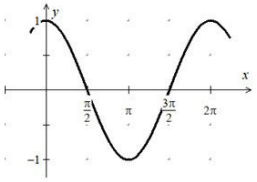
EX #6: Since the period of the cosine function is 2π, we will graph the function on the interval $[0, 2\pi]$.

A. Make a table of values (x, y) on $y = \cos x$ from the unit circle.

The ***five key points*** on the parent function of the cosine curve will have a different pattern but the same naming conventions: the *intercepts*, the *maximum points*, and the *minimum points*. The points will be again be divided up into quarter intervals. Let's look at the graph of the cosine function.

The Graph of $y = \cos x$

EX #7: Use the table of values from example 6 to label the five key points for the parent function.



Key Properties of Cosine Functions

$y = A\ \cos(Bx)$, with $a \neq 0$, $b > 0$, x in radians

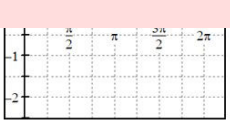
Domain: Range:

Amplitude: Period:

Key Points:

Graphing Variations of $y = \cos x$

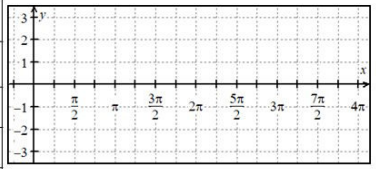
Value of x:	Value of y:
π	
$\frac{3\pi}{2}$	
2π	



Graphing Variations of $y = \cos x$

EX #9: Use the five key points of the parent function to graph $y = -2\cos\left(\frac{1}{2}x\right)$.

Value of x:	Value of y:
0	
$\frac{\pi}{2}$	
π	
$\frac{3\pi}{2}$	
2π	
$\frac{5\pi}{2}$	
3π	
$\frac{7\pi}{2}$	
4π	



EX #10: Graph $y = 3\cos(x) - 2$

Value of x:	Value of y:
2π	

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Guided Notes

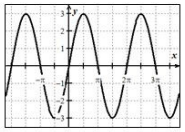
3.4 **Sine and Cosine Function Graphs Practice Set 1**

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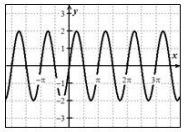
Date _____ Period _____

Problems 1 – 4, find the amplitude and period of each sine curve. Then write an equation for each curve.

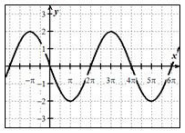
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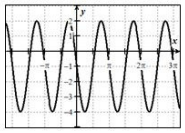
2.



3.

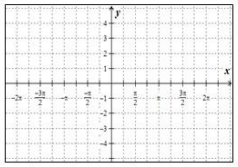


4.

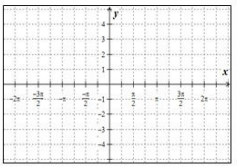


Problems 5 – 8, sketch one cycle of each sine curve. Assume $a > 0$. Write an equation for each graph.

5. amplitude 3; period 2π

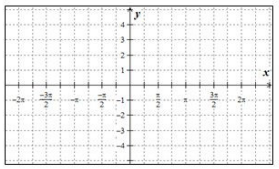


6. amplitude 2; period π

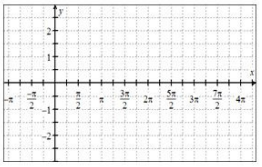


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7. amplitude 2, period 4π



8. amplitude 1.5; period 3π

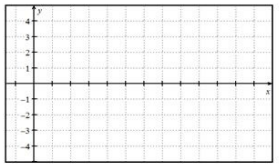


Problems 9 – 12, sketch one cycle of the graph of each sine function.

9. $y = 2\sin x$

Amplitude:

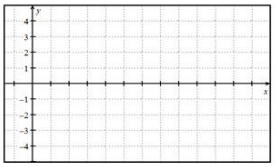
Period:



10. $y = -3\sin\left(\frac{x}{2}\right)$

Amplitude:

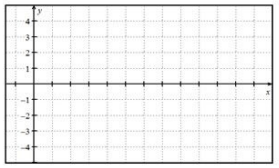
Period:



11. $y = \frac{5}{2}\sin(2x)$

Amplitude:

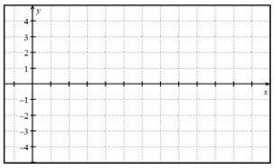
Period:



12. $y = -2\sin\left(\frac{2}{3}x\right)$

Amplitude:

Period:



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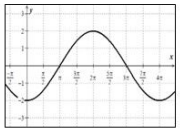
3.4 **Sine and Cosine Function Graphs Practice Set 2**

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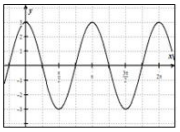
Date _____ Period _____

Problems 1 – 4, find the amplitude and period of each cosine curve. Then write an equation for each curve.

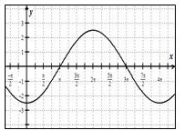
1.



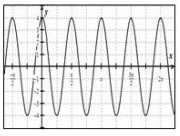
2.



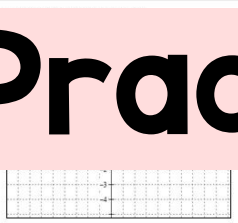
3.

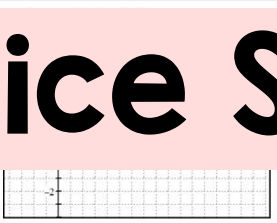


4.



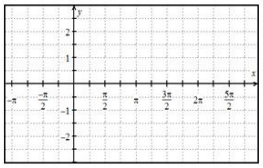
Problems 5 – 8, sketch one cycle of each cosine curve. Assume $a > 0$. Write an equation for each graph.



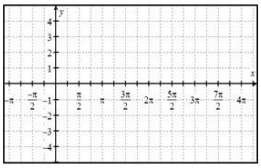


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7. amplitude 1.5, period 2π



8. amplitude 3; period 4π

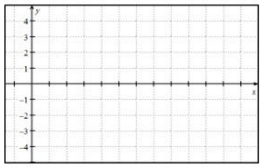


Problems 9 – 12, sketch one cycle of the graph of each cosine function.

9. $y = -4\cos x$

Amplitude:

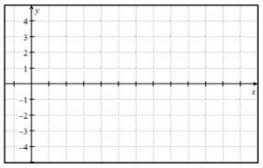
Period:



10. $y = 2\cos\left(\frac{x}{2}\right)$

Amplitude:

Period:



11. $y = -\frac{7}{2}\cos(2x)$

Amplitude:

12. $y = \cos\left(\frac{2}{3}x\right)$

Amplitude:





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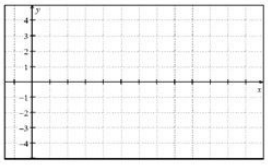
Practice Sets

3.4 Sine and Cosine Function Graphs Set 1 **Form A**

Name _____

Date _____ Period _____

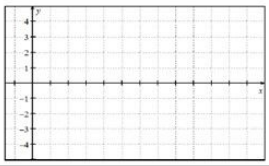
1. Sketch one cycle of the sine curve. Assume $a > 0$. Write an equation for the graph. Amplitude 4, period 6π



Problems 2 and 3, sketch one cycle of the graph of each sine function. State the amplitude and period.

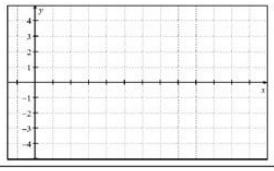
2. $y = 2\sin(4x)$

Amplitude: Period:



3. $y = -3\sin\left(\frac{x}{4}\right)$

Amplitude: Period:



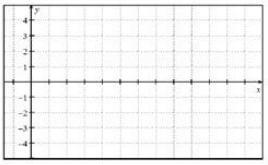
Grade:

3.4 Sine and Cosine Function Graphs Set 1 **Form B**

Name _____

Date _____ Period _____

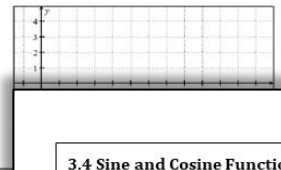
1. Sketch one cycle of the sine curve. Assume $a > 0$. Write an equation for the graph. Amplitude 3, period 4π



Problems 2 and 3, sketch one cycle of the graph of each sine function. State the amplitude and period.

2. $y = 3\sin(6x)$

Amplitude: Period:



3. $y = -3\sin\left(\frac{x}{4}\right)$

Amplitude: Period:

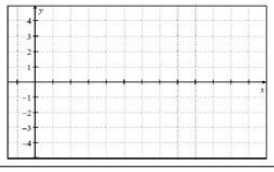
Grade:

3.4 Sine and Cosine Function Graphs Set 2 **Form A**

Name _____

Date _____ Period _____

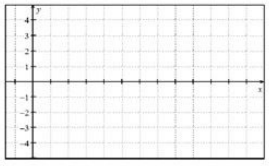
1. Sketch one cycle of the cosine curve. Assume $a > 0$. Write an equation for the graph. Amplitude 4, period 6π



Problems 2 and 3, sketch one cycle of the graph of each cosine function. State the amplitude and period.

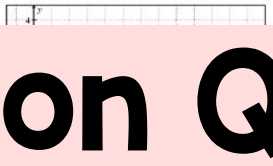
2. $y = -3\cos(2x)$

Amplitude: Period:



3. $y = 4\cos\left(\frac{x}{2}\right)$

Amplitude: Period:



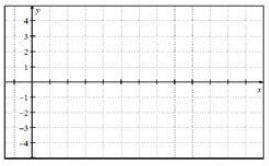
Grade:

3.4 Sine and Cosine Function Graphs Set 2 **Form B**

Name _____

Date _____ Period _____

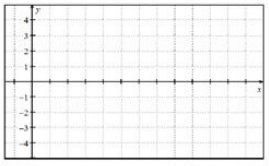
1. Sketch one cycle of the cosine curve. Assume $a > 0$. Write an equation for the graph. Amplitude 3, period 4π



Problems 2 and 3, sketch one cycle of the graph of each cosine function. State the amplitude and period.

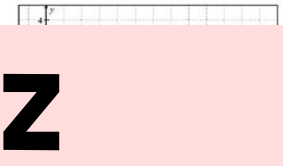
2. $y = -4\cos(3x)$

Amplitude: Period:



3. $y = 2\cos\left(\frac{x}{3}\right)$

Amplitude: Period:



Grade:

Daily Lesson Quiz