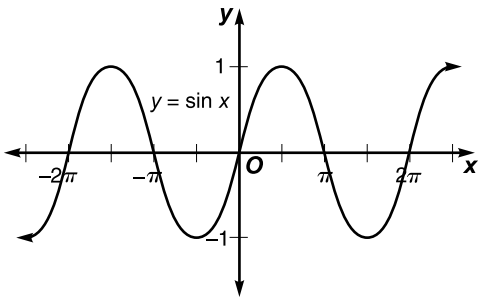
NAME _____ DATE _____ PERIOD _____

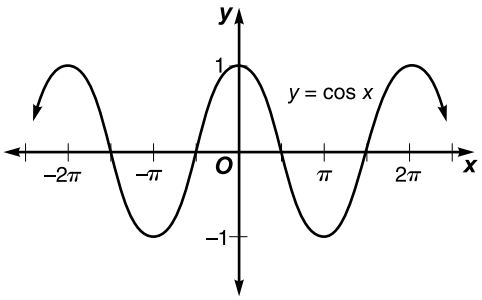
6-3

Study Guide

Graphing Sine and Cosine Functions

If the values of a function are the same for each given interval of the domain, the function is said to be **periodic.** Consider the graphs of $y = \sin x$ and $y = \cos x$ shown below. Notice that for both graphs the period is 2π and the range is from -1 to 1, inclusive.





Properties of the Graph of $y = \sin x$	Properties of the Graph of $y = \cos x$
The x-intercepts are located at πn, where n is an integer.	The x-intercepts are located at $\frac{\pi}{2} + \pi n$, where n is an integer.
The y-intercept is 0.	The y-intercept is 1.
The maximum values are $y = 1$ and occur when $x = \frac{\pi}{2} + 2\pi n$, when n is an integer.	The maximum values are $y = 1$ and occur when $x = \pi n$, where n is an even integer.
The minimum values are $y = -1$ and occur when $x = \frac{3\pi}{2} + 2\pi n$, where n is an integer.	The minimum values are $y = -1$ and occur when $x = \pi n$, where n is an odd integer.

Example 1 **Find $\sin \frac{7\pi}{2}$ by referring to the graph of the sine function.**

The period of the sine function is 2π. Since $\frac{7\pi}{2} > 2\pi$, rewrite $\frac{7\pi}{2}$ as a sum involving 2π.

$\frac{7\pi}{2} = 2\pi(1) + \frac{3\pi}{2}$ *This is a form of* $\frac{3\pi}{2} + 2\pi n$.

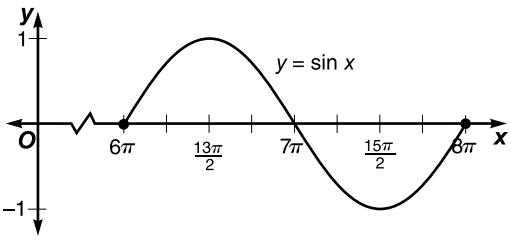
So, $\sin \frac{7\pi}{2} = \sin \frac{3\pi}{2}$ or -1.

Example 2 **Find the values of θ for which $\cos \theta = 0$ is true.**

Since $\cos \theta = 0$ indicates the x-intercepts of the cosine function, $\cos \theta = 0$ if $\theta = \frac{\pi}{2} + \pi n$, where n is an integer.

Example 3 **Graph $y = \sin x$ for $6\pi \leq x \leq 8\pi$.**

The graph crosses the x-axis at 6π, 7π, and 8π. Its maximum value of 1 is at $x = \frac{13\pi}{2}$, and its minimum value of -1 is at $x = \frac{15\pi}{2}$. Use this information to sketch the graph.



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6-3

Practice

Graphing Sine and Cosine Functions

Find each value by referring to the graph of the sine or the cosine function.

1. $\cos \pi$

2. $\sin \frac{3\pi}{2}$

3. $\sin \left(-\frac{7\pi}{2}\right)$

Find the values of θ for which each equation is true.

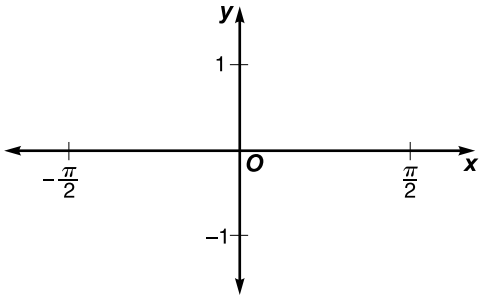
4. $\sin \theta = 0$

5. $\cos \theta = 1$

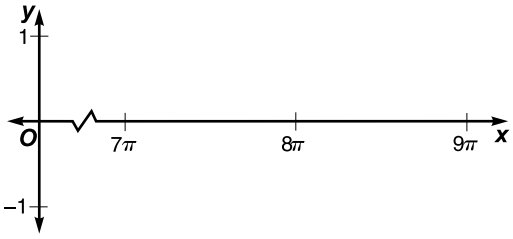
6. $\cos \theta = -1$

Graph each function for the given interval.

7. $y = \sin x; -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

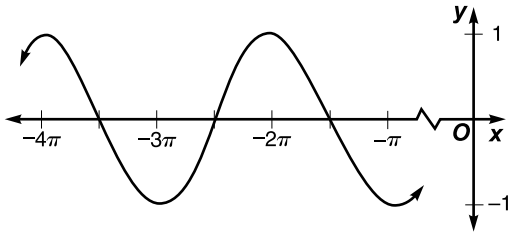


8. $y = \cos x; 7\pi \leq x \leq 9\pi$

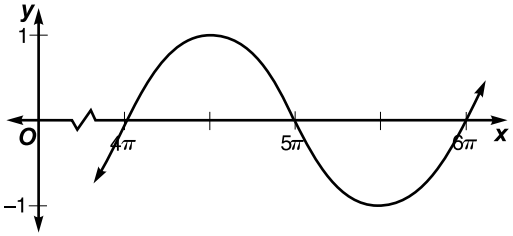


Determine whether each graph is y = sin x, y = cos x, or neither.

9.



10.



11. ***Meteorology*** The equation $y = 70.5 + 19.5 \sin \left[\frac{\pi}{6}(t - 4)\right]$ models the average monthly temperature for Phoenix, Arizona, in degrees Fahrenheit. In this equation, t denotes the number of months, with $t = 1$ representing January. What is the average monthly temperature for July?