

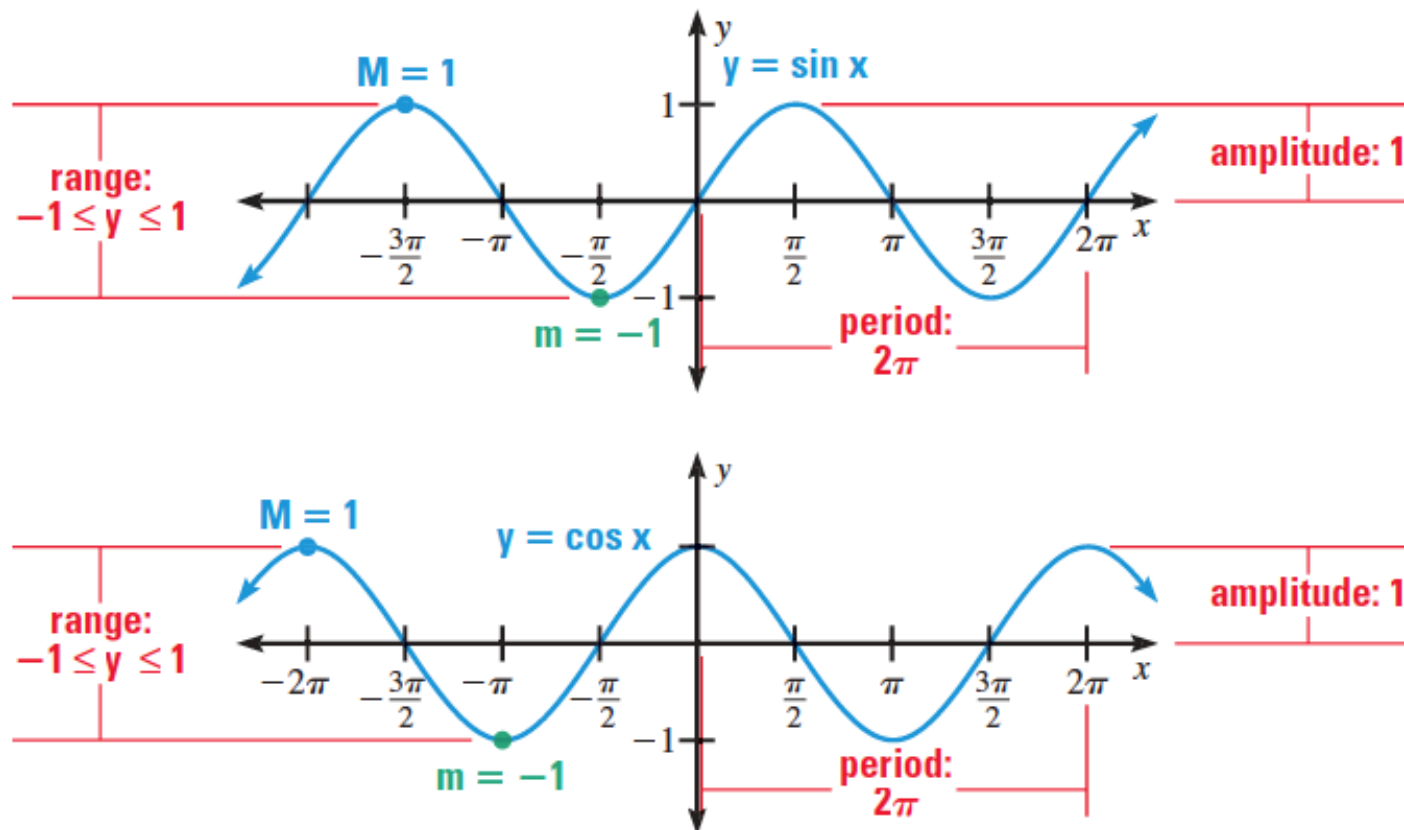
Objective

Students will be able to graph sine and cosine functions.

Graphing Trigonometric Functions

In this lesson, we will learn to graph functions of the form $y = a \sin bx$ and $y = a \cos bx$ where a and b are positive constants and x is in radian measure.

Graphs of parent functions $y = \sin x$ and $y = \cos x$:



Characteristics of $y = \sin x$ and $y = \cos x$

- The domain of each function is all real numbers
- The range of each function is $-1 \leq y \leq 1$. Therefore, the minimum value of each function is $m = -1$ and the maximum value is $M = 1$
- The amplitude of each function's graph is half the difference of the maximum M and the minimum m
- Each function is periodic, which means that its graph has a repeating pattern
- The shortest repeating portion of the graph is called a cycle
- The horizontal length of each cycle is called the period

Amplitude and Period of graphs

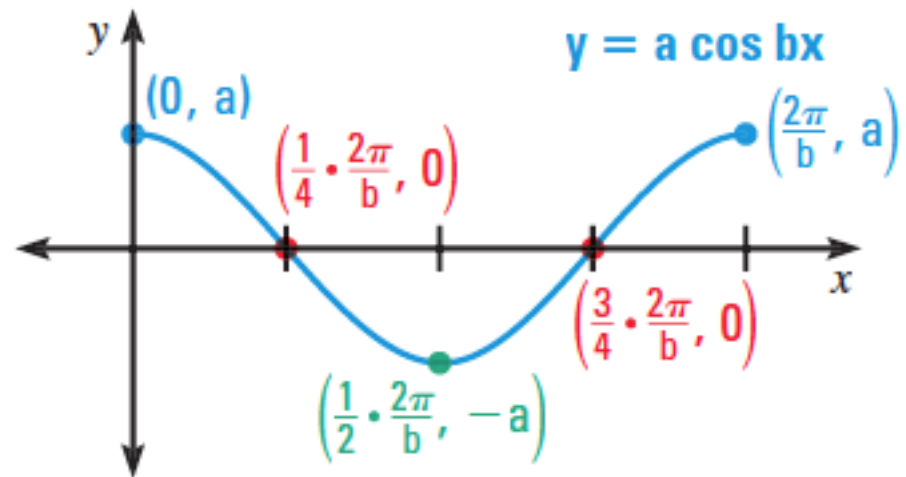
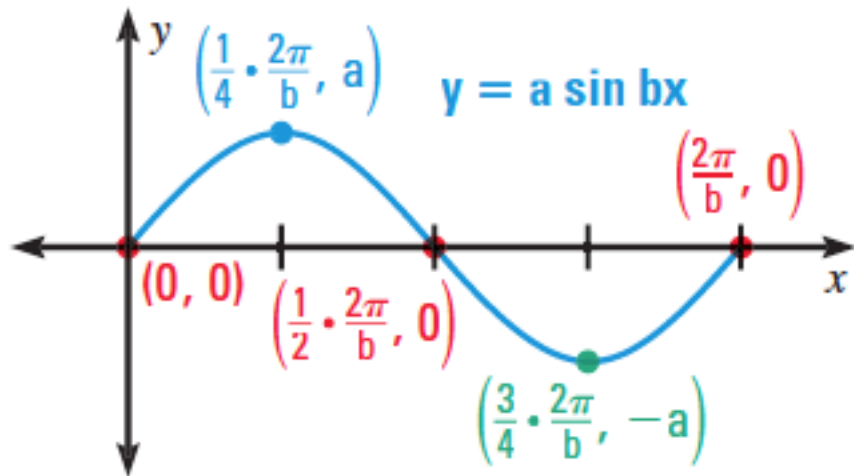
The amplitude and period of the graphs $y = a \sin bx$ and $y = a \cos bx$, where a and b are nonzero numbers, are as follows:

$$\text{Amplitude} = |a|$$

$$\text{Period} = \frac{2\pi}{|b|}$$

Graphing Key Points

****To graph trigonometric functions, plot the key points (maximums, minimums, and x-intercepts)**



Sketch the graphs of the following functions:

1) $y = 4 \sin x$

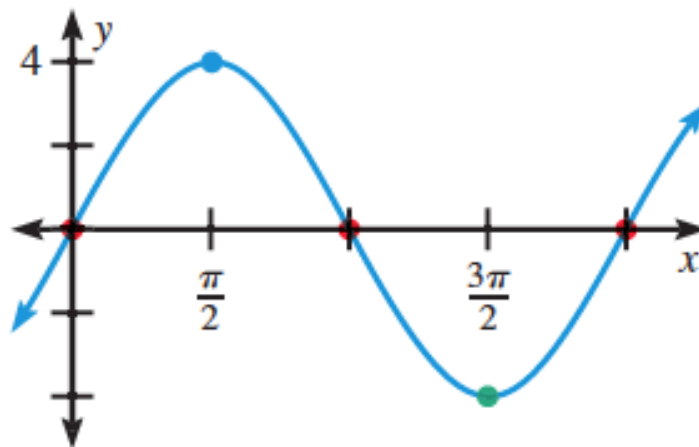
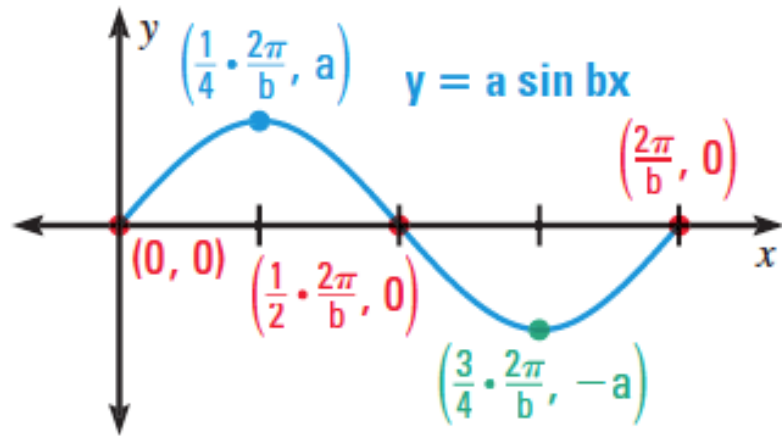
****To find key points, break up your period into fourths and use what you know about the flow of the parent function to fill in your points**

amplitude: $|a| = |4| = 4$ period: $\frac{2\pi}{|b|} = \frac{2\pi}{|1|} = \frac{2\pi}{1} = 2\pi$

y-int: $(0, 0)$

x-ints: $(\frac{1}{2} \cdot 2\pi, 0) = (\pi, 0)$
 $(2\pi, 0)$

min: $(\frac{3}{4} \cdot 2\pi, -4) = (\frac{3\pi}{2}, -4)$ max: $(\frac{1}{4} \cdot 2\pi, 4) = (\frac{\pi}{2}, 4)$



Sketch the graphs of the following functions:

2) $y = \cos 4x$

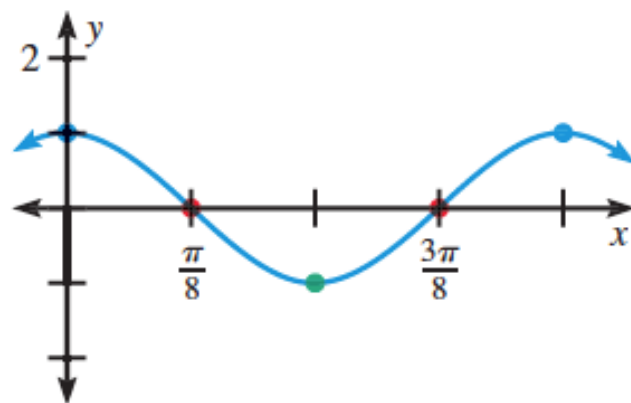
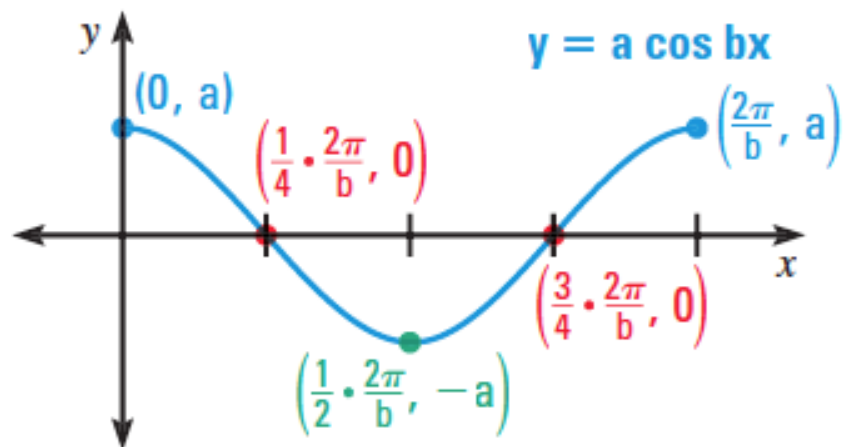
amplitude: $|a| = |1| = 1$

period: $\frac{2\pi}{|b|} = \frac{2\pi}{|4|} = \frac{2\pi}{4} = \frac{\pi}{2}$

y-int: $(0, 1)$

x-ints: $\left(\frac{1}{4} \cdot \frac{\pi}{2}, 0\right) = \left(\frac{\pi}{8}, 0\right)$
 $\left(\frac{3}{4} \cdot \frac{\pi}{2}, 0\right) = \left(\frac{3\pi}{8}, 0\right)$

min: $\left(\frac{1}{2} \cdot \frac{\pi}{2}, -1\right) = \left(\frac{\pi}{4}, -1\right)$ maxs: $(0, 1)$ $\left(\frac{\pi}{2}, 1\right)$



Sketch the graphs of the following functions:

3) $y = \frac{1}{2} \cos 2\pi x$

****To find key points, break up your period into fourths and use what you know about the flow of the parent function to fill in your points**

amplitude: $|a| = \left| \frac{1}{2} \right| = \frac{1}{2}$

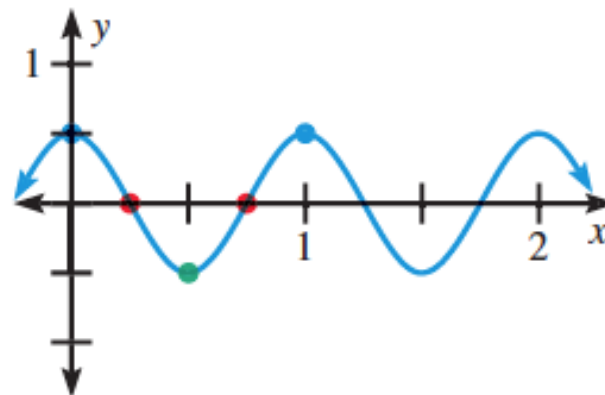
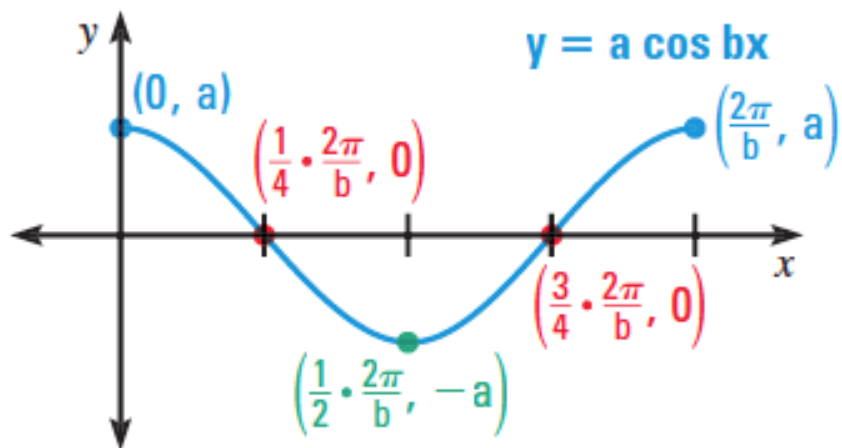
period: $\frac{2\pi}{|b|} = \frac{2\pi}{|2\pi|} = \frac{2\pi}{2\pi} = 1$

y-int: $(0, \frac{1}{2})$

x-ints: $(\frac{1}{4} \cdot 1, 0) = (\frac{1}{4}, 0)$

$(\frac{3}{4} \cdot 1, 0) = (\frac{3}{4}, 0)$

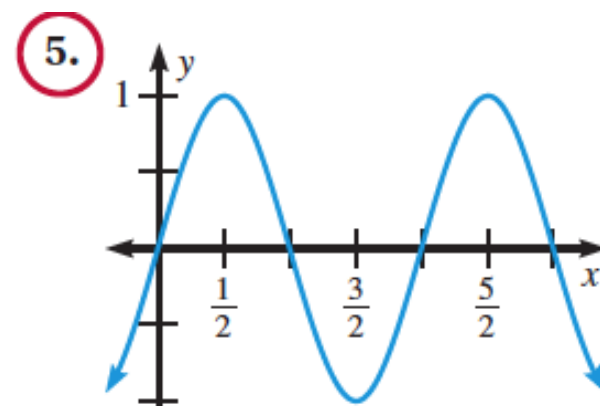
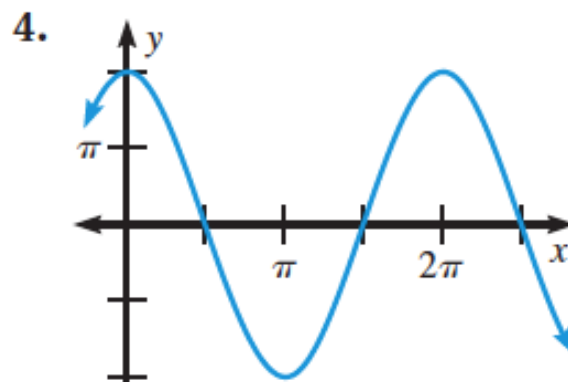
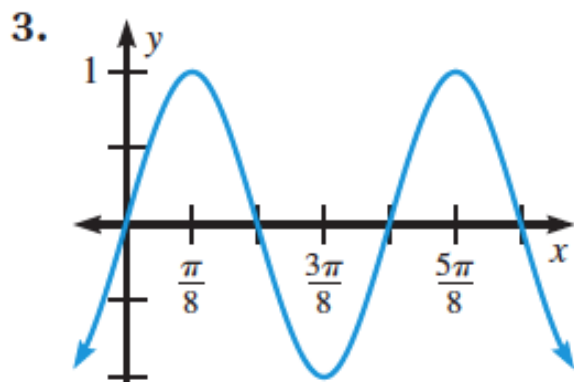
mins: $(\frac{1}{2} \cdot 1, -\frac{1}{2}) = (\frac{1}{2}, -\frac{1}{2})$ max: $(0, \frac{1}{2})$ $(1, \frac{1}{2})$



Homework

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ANALYZING FUNCTIONS Identify the amplitude and the period of the graph of the function.



GRAPHING Graph the function.

7. $y = 4 \cos x$