

Study Guide

Amplitude and Period of Sine and Cosine Functions

The **amplitude** of the functions $y = A \sin \theta$ and $y = A \cos \theta$ is the absolute value of A , or $|A|$. The period of the functions $y = \sin k\theta$ and $y = \cos k\theta$ is $\frac{2\pi}{k}$, where $k > 0$.

Example 1 State the amplitude and period for the function

$$y = -2 \cos \frac{\theta}{4}.$$

The definition of *amplitude* states that the amplitude of $y = A \cos \theta$ is $|A|$. Therefore, the amplitude of $y = -2 \cos \frac{\theta}{4}$ is $|-2|$, or 2.

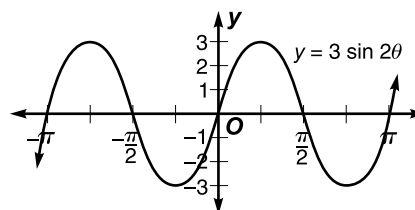
The definition of *period* states that the period of $y = \cos k\theta$ is $\frac{2\pi}{k}$. Since $-2 \cos \frac{\theta}{4}$ equals $-2 \cos \left(\frac{1}{4}\theta\right)$, the period is $\frac{1}{4}$ or 8π .

Example 2 State the amplitude and period for the function $y = 3 \sin 2\theta$. Then graph the function.

Since $A = 3$, the amplitude is $|3|$ or 3.

Since $k = 2$, the period is $\frac{2\pi}{2}$ or π .

Use the amplitude and period above and the basic shape of the sine function to graph the equation.



Example 3 Write an equation of the sine function with amplitude 6.7 and period 3π .

The form of the equation will be $y = A \sin k\theta$. First find the possible values of A for an amplitude of 6.7.

$$|A| = 6.7$$

$$A = 6.7 \text{ or } -6.7$$

Since there are two values of A , two possible equations exist.

Now find the value of k when the period is 3π .

$$\frac{2\pi}{k} = 3\pi \quad \text{The period of the sine function is } \frac{2\pi}{k}.$$

$$k = \frac{2\pi}{3\pi} \text{ or } \frac{2}{3}$$

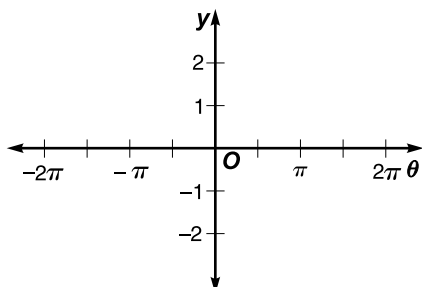
The possible equations are $y = 6.7 \sin \frac{2}{3}\theta$ or $y = -6.7 \sin \frac{2}{3}\theta$.

Practice

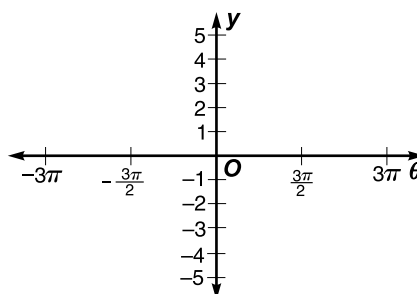
Amplitude and Period of Sine and Cosine Functions

State the amplitude and period for each function. Then graph each function.

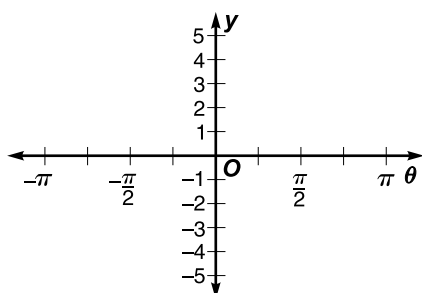
1. $y = -2 \sin \theta$



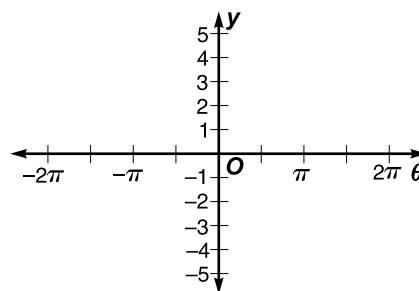
2. $y = 4 \cos \frac{\theta}{3}$



3. $y = 1.5 \cos 4\theta$



4. $y = -\frac{2}{3} \sin \frac{\theta}{2}$



Write an equation of the sine function with each amplitude and period.

5. amplitude = 3, period = 2π

6. amplitude = 8.5, period = 6π

Write an equation of the cosine function with each amplitude and period.

7. amplitude = 0.5, period = 0.2π

8. amplitude = $\frac{1}{5}$, period = $\frac{2}{5}\pi$

- 9. Music** A piano tuner strikes a tuning fork for note A above middle C and sets in motion vibrations that can be modeled by the equation $y = 0.001 \sin 880\pi t$. Find the amplitude and period for the function.