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I. Model Problems.
II. Practice
III. Challenge Problems
IV. Answer Key

Web Resources

- Unit Circle Game
- Graph and Formula of the Unit Circle
- Unit Circle Printables (fill in the blank unit circle)
- Graph of Sine to Unit Circle
- Finding the Reference Angle
- Converting Radians to Degrees
- Period of Sine and Cosine curves

# Intro to Sine and Cosine

I. Model Problems

$$y = A \sin \theta \text{ and } y = A \cos \theta$$

If A is negative the graph is reflected.

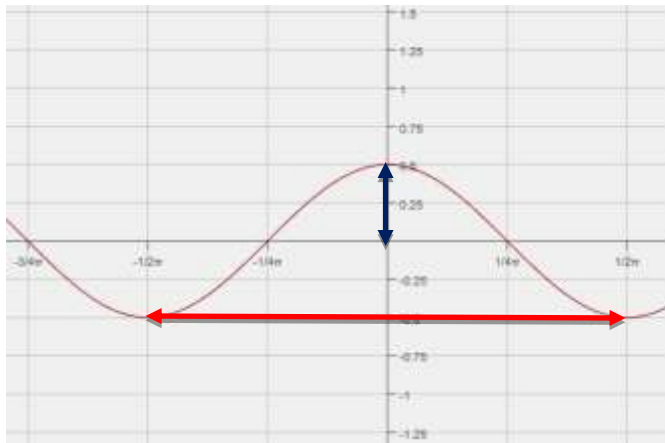$|A|$ is the amplitude of the function.

Amplitude is the height of the oscillation of the sine (cosine) function. It is half the distance between the maximum and minimum y-values.

Trig functions are periodic meaning there is a pattern of y-values that repeat at regular intervals (cycles). The **period** of the function is the horizontal distance of one cycle.
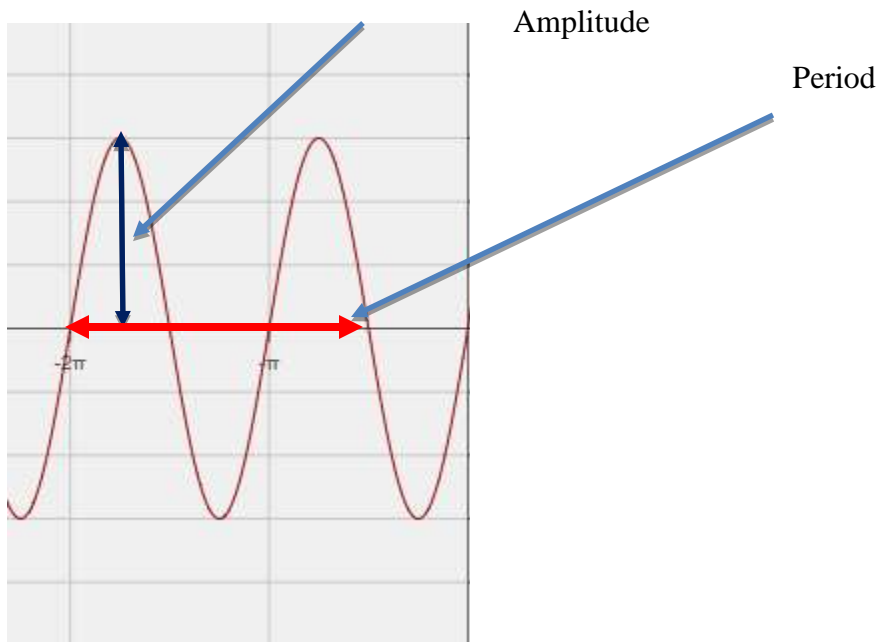
Amplitude

Period

In this example we will find the amplitude and period of a graphed function.

Example 1: **Find the amplitude and period of the given graph.**

Find the amplitude and period. For the period look for the beginning and ending of a cycle.

The amplitude is 0.5. The period is π.

Answer: The amplitude is 0.5. The period is π.

In these examples we will graph a sine and cosine function using a table of values.
Example 2: **Graph $y = \sin x$.**

x	$\sin x$
0	0
$\dfrac{\pi}{6}$	$\dfrac{1}{2}$
$\dfrac{\pi}{2}$	1
$\dfrac{5\pi}{6}$	$\dfrac{1}{2}$
π	0
$\dfrac{7\pi}{6}$	$-\dfrac{1}{2}$
$\dfrac{3\pi}{2}$	-1
$\dfrac{11\pi}{6}$	$-\dfrac{1}{2}$
2π	0

Use the unit circle and $\sin\theta = \dfrac{y}{r}$ to create a table of values. Choose θ such that y is a rational value.
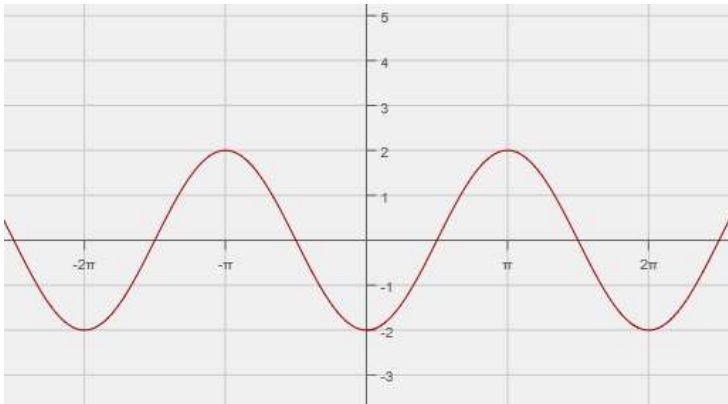
Answer:

Graph coordinates. Label *x*-axis in terms of π.

***Example 2*: Graph $y = -2 \cos x$.**

x	$\cos x$	$-2 \cos x$
0	1	-2
$\dfrac{\pi}{3}$	$\dfrac{1}{2}$	-1
$\dfrac{\pi}{2}$	0	0
$\dfrac{2\pi}{3}$	$-\dfrac{1}{2}$	1
π	-1	2
$\dfrac{4\pi}{3}$	$-\dfrac{1}{2}$	1
$\dfrac{3\pi}{2}$	0	0
$\dfrac{5\pi}{3}$	$\dfrac{1}{2}$	-1
2π	1	-2

Use the unit circle and $\cos \theta = \dfrac{x}{r}$ to create a table of values. Choose θ such that x is a rational value.

Answer:

Graph coordinates. Label x-axis in terms of π.

II. Practice Problems
Find the amplitude of the given functions.

1. $y = 3 \sin x$

2. $y = -\dfrac{2}{5} \cos x$

3. $y = \cos x$

4. $y = -\dfrac{1}{2} \sin x$
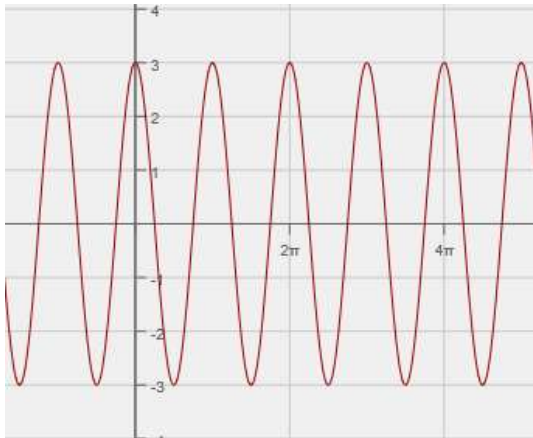
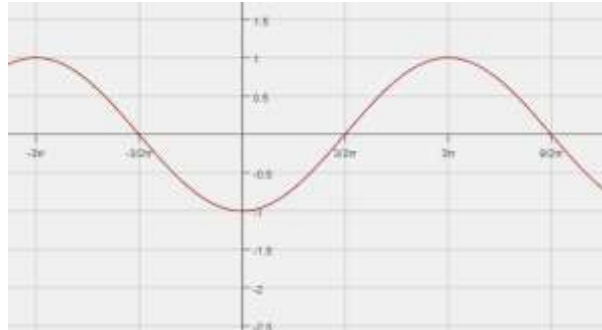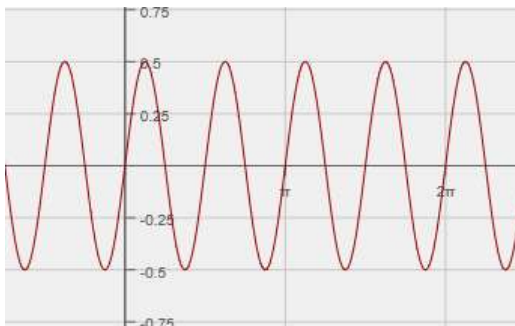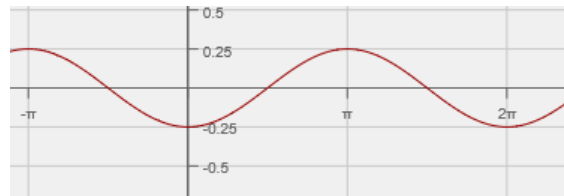**Find the amplitude and period of the given graph.**

5.
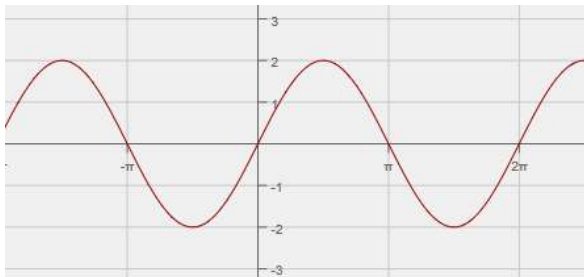
6.
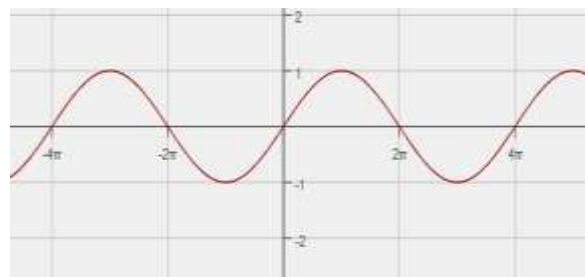
7.

8.

9.

10.

Graph the following functions. Identify the amplitude and period.

11. $y = \sin x$

12. $y = \cos x$

13. $y = 2 \sin x$

14. $y = -2 \sin x$
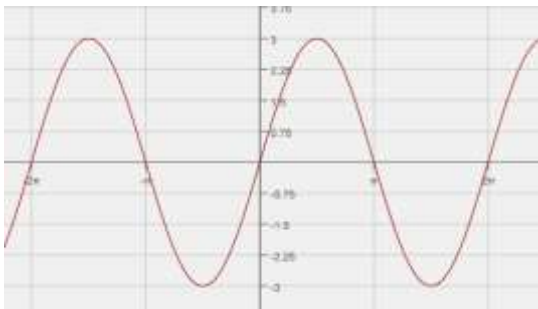
15. $y = -\frac{1}{2} \sin x$

16. $y = 4 \cos x$

17. $y = -4 \cos x$

18. $y = \frac{1}{4} \cos x$

19. $y = -\frac{1}{4} \cos x$

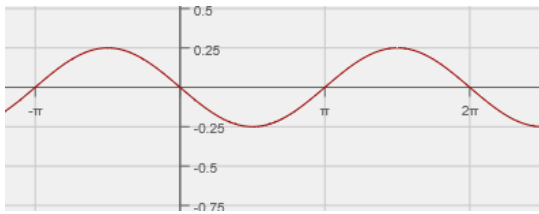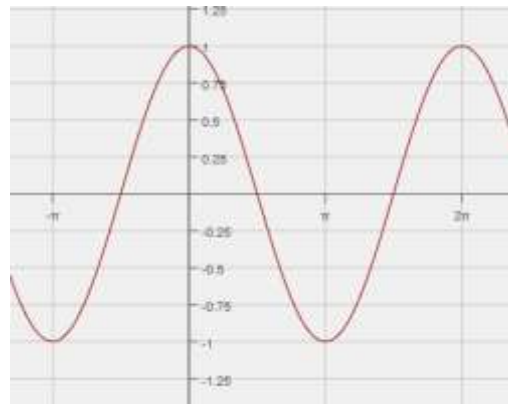**Write the equations of the following graphs.**

20.

21.

22.

23.

III. Challenge Problems

24. Problems 11 and 12 are the parent graphs of sine and cosine. How do they compare?

25. Graph $y = \sin^2 x + \cos^2 x$.

IV. Answers

1. 3

2. $\frac{2}{5}$
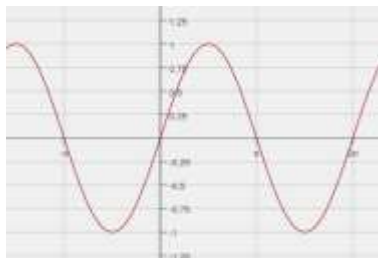
3. 1

4. $\frac{1}{2}$

5. Amp = 2 Per = 2π
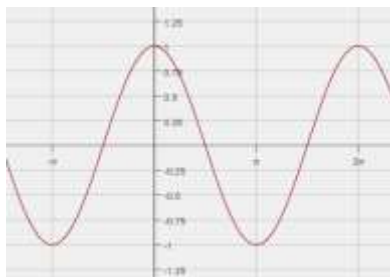
6. Amp = 1 Per = 4π

7. Amp = 3 Per = π

8. Amp = 1 Per = 6π

9. Amp = $\frac{1}{2}$ Per = $\frac{\pi}{2}$

10. Amp = $\frac{1}{4}$ Per = 2π

11. Amp = 1 Per = 2π
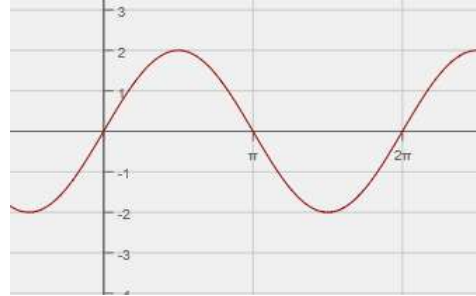

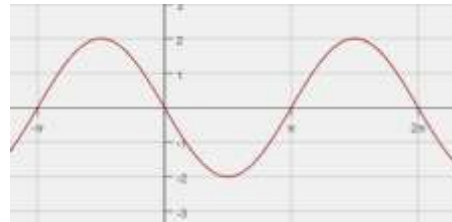12. Amp = 1 Per = 2π

13. Amp = 2 Per = 2π
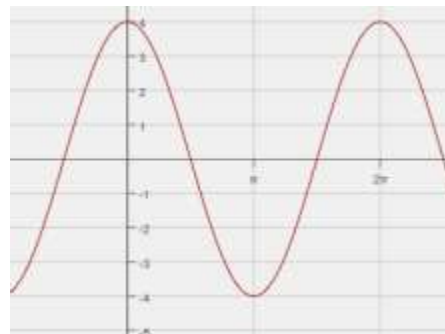

14. Amp = 2 Per = 2π
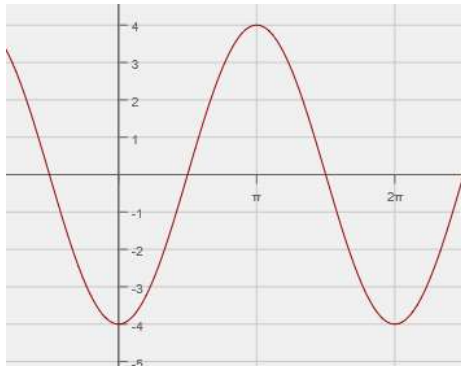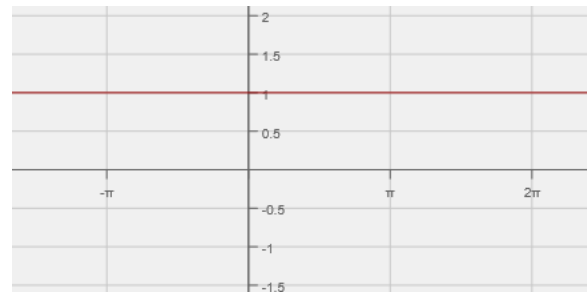

15. Amp = $\frac{1}{2}$ Per = 2π

16. Amp = 4 Per = 2π

17. Amp = 4 Per = 2π

25.

18. Amp = $\frac{1}{4}$ Per = 2π

19. Amp = $\frac{1}{4}$ Per = 2π

20. $y = 3 \sin x$

21. $y = -\frac{1}{2} \cos x$

22. $y = -\frac{1}{4} \sin x$

23. $y = \cos x$

24. There is a shift of $\frac{\pi}{2}$ in the horizontal direction.