

**Section 4.2 Trigonometric Functions: The Unit Circle**

**Objective:** In this lesson you learned how to identify a unit circle and describe its relationship to real numbers.

Course Number

Instructor

Date

**Important Vocabulary** Define each term or concept.

Unit circle

Periodic

Period

**I. The Unit Circle** (Page 269)

As the real number line is wrapped around the unit circle, each real number  $t$  corresponds to . . .

The real number  $2\pi$  corresponds to the point \_\_\_\_\_ on the unit circle.

Each real number  $t$  also corresponds to a \_\_\_\_\_ (in standard position) whose radian measure is  $t$ . With this interpretation of  $t$ , the arc length formula  $s = r\theta$  (with  $r = 1$ ) indicates that . . .

***What you should learn***

How to identify a unit circle and describe its relationship to real numbers

**II. The Trigonometric Functions** (Pages 270–272)

The coordinates  $x$  and  $y$  are two functions of the real variable  $t$ . These coordinates can be used to define six trigonometric functions of  $t$ . List the abbreviation for each trigonometric function.

Sine \_\_\_\_\_ Cosecant \_\_\_\_\_

Cosine \_\_\_\_\_ Secant \_\_\_\_\_

Tangent \_\_\_\_\_ Cotangent \_\_\_\_\_

***What you should learn***

How to evaluate trigonometric functions using the unit circle

Let  $t$  be a real number and let  $(x, y)$  be the point on the unit circle corresponding to  $t$ . Complete the following definitions of the trigonometric functions:

$$\sin t = \underline{\hspace{2cm}} \qquad \cos t = \underline{\hspace{2cm}}$$

$$\tan t = \underline{\hspace{2cm}} \qquad \cot t = \underline{\hspace{2cm}}$$

$$\sec t = \underline{\hspace{2cm}} \qquad \csc t = \underline{\hspace{2cm}}$$

The cosecant function is the reciprocal of the \_\_\_\_\_ function. The cotangent function is the reciprocal of the \_\_\_\_\_ function. The secant function is the reciprocal of the \_\_\_\_\_ function.

Complete the following table showing the correspondence between the real number  $t$  and the point  $(x, y)$  on the unit circle when the unit circle is divided into eight equal arcs.

$t$	0	$\pi/4$	$\pi/2$	$3\pi/4$	$\pi$	$5\pi/4$	$3\pi/2$	$7\pi/4$
$x$								
$y$								

Complete the following table showing the correspondence between the real number  $t$  and the point  $(x, y)$  on the unit circle when the unit circle is divided into 12 equal arcs.

$t$	0	$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$5\pi/6$	$\pi$	$7\pi/6$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$11\pi/6$
$x$												
$y$												

**Example 1:** Find the following:

$$(a) \cos \frac{\pi}{3} \qquad (b) \tan \frac{3\pi}{4} \qquad (c) \csc \frac{7\pi}{6}$$

### III. Domain and Period of Sine and Cosine (Pages 272–273)

The sine function's domain is \_\_\_\_\_,  
and its range is \_\_\_\_\_.

**What you should learn**  
How to use domain and period to evaluate sine and cosine functions

The cosine function's domain is \_\_\_\_\_,  
and its range is \_\_\_\_\_.

The period of the sine function is \_\_\_\_\_. The  
period of the cosine function is \_\_\_\_\_.

Which trigonometric functions are even functions?

\_\_\_\_\_

Which trigonometric functions are odd functions?

\_\_\_\_\_

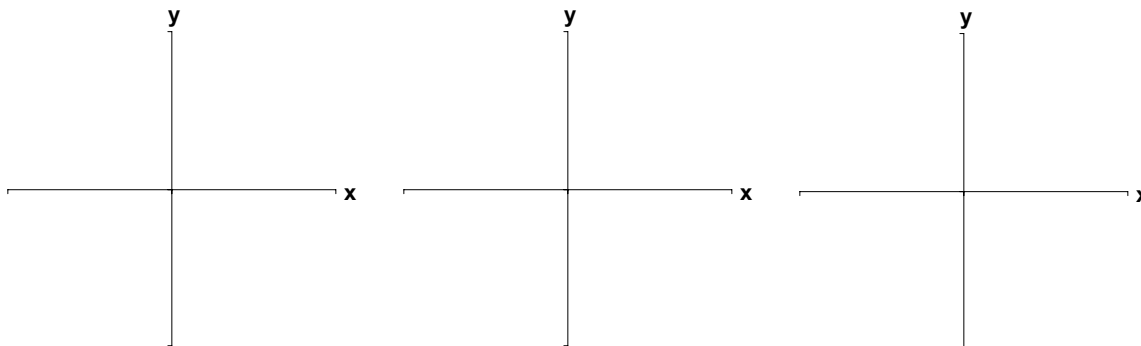
**Example 2:** Evaluate  $\sin \frac{31\pi}{6}$

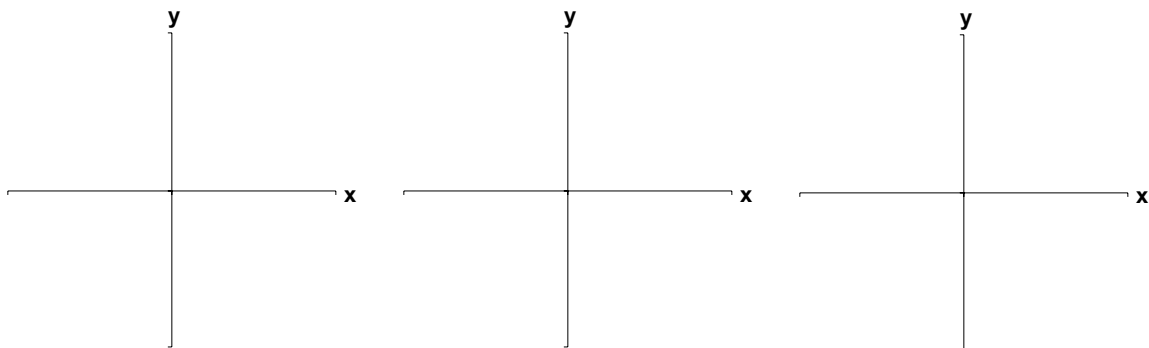
#### IV. Evaluating Trigonometric Functions with a Calculator (Page 273)

To evaluate the secant function with a calculator, . . .

*What you should learn*  
How to use a calculator  
to evaluate trigonometric  
functions

**Example 3:** Use a calculator to evaluate (a)  $\tan 4\pi/3$ , and  
(b)  $\cos 3$ .



**Additional notes****Homework Assignment**

Page(s)

Exercises