Name: ____________

Chapter 4 Trigonometry

Section 4.1 Radian and Degree Measure

Objective: In this lesson you learned how to describe an angle and to convert between radian and degree measure.

Course Number
Instructor
Date

Important Vocabulary Define each term or concept.

Trigonometry

Central angle of a circle

Complementary angles

Supplementary angles

Degree

I. Angles (Page 282)

What you should learn
How to describe angles

An **angle** is determined by . . .

The **initial side** of an angle is . . .

The **terminal side** of an angle is . . .

The **vertex** of an angle is . . .

An angle is in **standard position** when . . .

A **positive angle** is generated by a ____________________ rotation; whereas a **negative angle** is generated by a ____________________ rotation.

If two angles are **coterminal,** then they have . . .

II. Radian Measure (Pages 283–285)

What you should learn
How to use radian measure

The measure of an angle is determined by . . .

One **radian** is the measure of a central angle θ that . . .

A central angle of one full revolution (counterclockwise) corresponds to an arc length of $s =$ ____________.

A full revolution around a circle of radius r corresponds to an angle of ___________ radians. A half revolution around a circle of radius r corresponds to an angle of ___________ radians.

Angles with measures between 0 and $\pi/2$ radians are ______________ angles. Angles with measures between $\pi/2$ and π radians are _______________ angles.

To find an angle that is coterminal to a given angle θ, . . .

Example 1: Find an angle that is coterminal with $\theta = -\pi/8$.

Example 2: Find the supplement of $\theta = \pi/4$.

III. Degree Measure (Pages 285–286)

What you should learn
How to use degree measure

A full revolution (counterclockwise) around a circle corresponds to ____________ degrees. A half revolution around a circle corresponds to ____________ degrees.

To convert degrees to radians, . . .

To convert radians to degrees, . . .

Example 3: Convert 120° to radians.

Example 4: Convert $9\pi/8$ radians to degrees.

Example 5: Complete the following table of equivalent degree and radian measures for common angles.

θ (degrees)	0°		45°		90°		270°
θ (radians)		$\pi/6$		$\pi/3$		π	

IV. Applications of Angles (Pages 287–289)

What you should learn
How to use angles to model and solve real-life problems

For a circle of radius r, a central angle θ intercepts an arc length s given by ________________ where θ is measured in radians. Note that if $r = 1$, then $s = \theta$, and the radian measure of θ equals

________________________.

Consider a particle moving at constant speed along a circular arc of radius r. If s is the length of the arc traveled in time t, then the **linear speed** of the particle is

linear speed = ________________________________

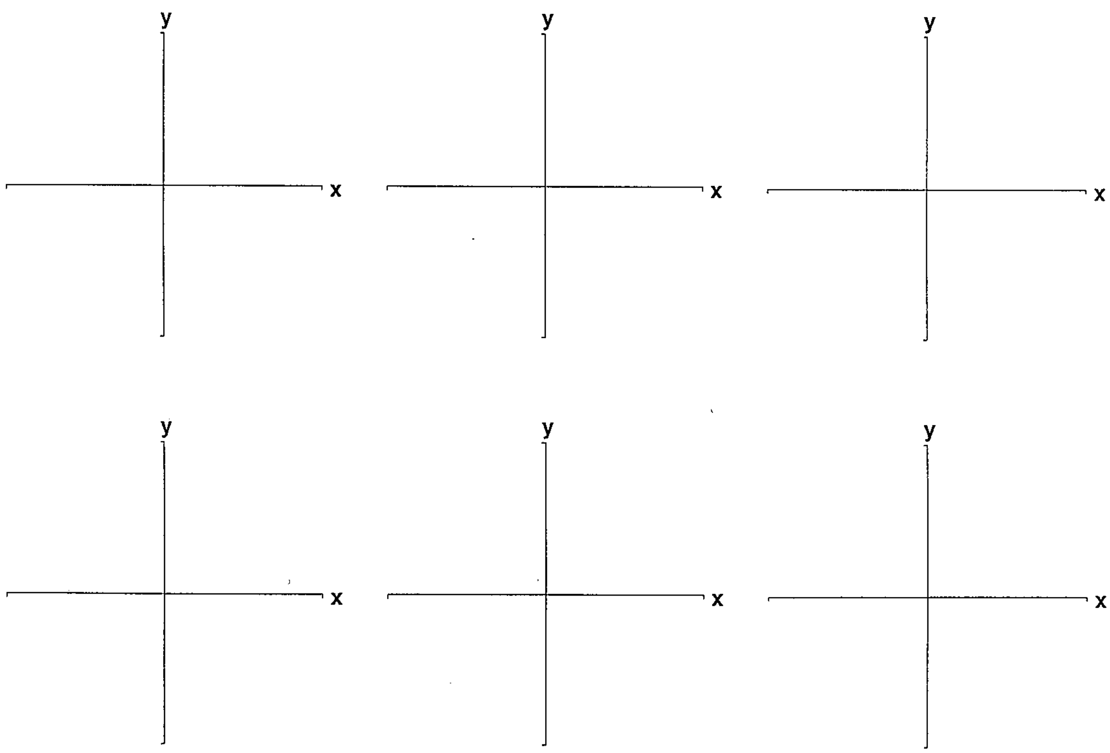
If θ is the angle (in radian measure) corresponding to the arc length s, then the **angular speed** of the particle is

angular speed = ________________________________

Example 6: A 6-inch-diameter gear makes 2.5 revolutions per second. Find the angular speed of the gear in radians per second.

A **sector** of a circle is . . .

For a circle of radius r, the area A of a sector of the circle with central angle θ is given by ______________________, where θ is measured in radians.



Homework Assignment

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Exercises 1–23 odd

Name: ____________

Course Number
Instructor
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Section 4.2 Trigonometric Functions: The Unit Circle

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

Important Vocabulary Define each term or concept.

Unit circle

Period

I. The Unit Circle (Page 294)

> *What you should learn*
> How to identify a unit circle and its relationship to real numbers

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

The real number 2π 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 . . .

II. The Trigonometric Functions (Pages 295–297)

> *What you should learn*
> How to evaluate trigonometric functions using the unit circle

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**	____________

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:

$\sin t =$ ____________ $\cos t =$ ____________

$\tan t =$ ____________ $\cot t =$ ____________

$\sec t =$ ____________ $\csc t =$ ____________

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

Example 1: Find the following:

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

III. Domain and Period of Sine and Cosine (Pages 297–298)

The sine function's domain is ________________________,

and its range is ________________________.

> ***What you should learn***
> How to use the 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 $\sin \frac{31\pi}{6}$

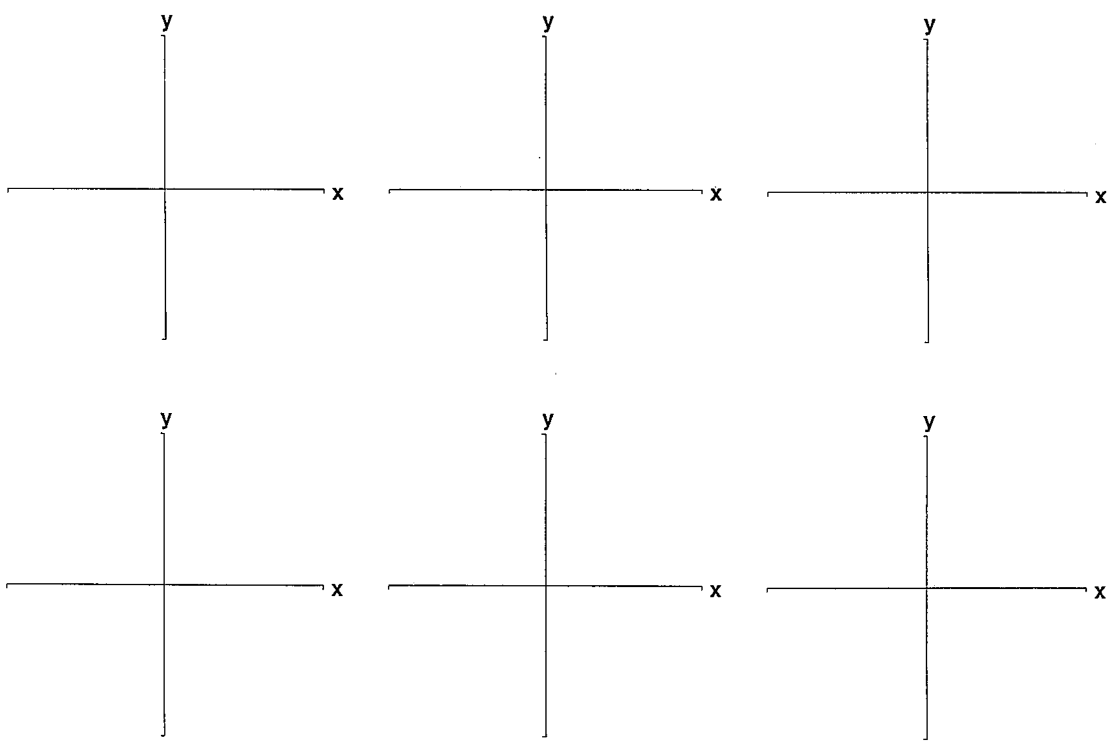
IV. Evaluating Trigonometric Functions with a Calculator (Page 298)

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

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

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

Additional notes



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Exercises 25 – 40

Name: ____________

Course Number
Instructor
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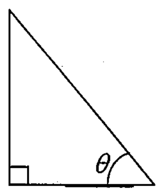
Section 4.3 Right Triangle Trigonometry

Objective: In this lesson you learned how to evaluate trigonometric functions of acute angles and how to use the fundamental trigonometric identities.

I. The Six Trigonometric Functions (Pages 301–303)

What you should learn
How to evaluate trigonometric functions of acute angles

In the right triangle shown below, label the three sides of the triangle relative to the angle labeled θ as (a) the **hypotenuse,** (b) the **opposite side,** and (c) the **adjacent side.**



Let θ be an acute angle of a right triangle. Define the six trigonometric functions of the angle θ using opp = the length of the side opposite θ, adj = the length of the side adjacent to θ, and hyp = the length of the hypotenuse.

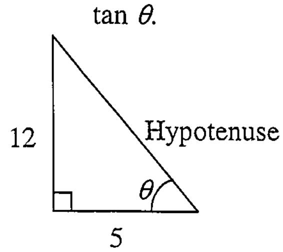
$\sin\theta =$ ____________ $\cos\theta =$ ____________

$\tan\theta =$ ____________ $\csc\theta =$ ____________

$\sec\theta =$ ____________ $\cot\theta =$ ____________

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.

Example 1: In the right triangle below, find $\sin\theta$, $\cos\theta$, and $\tan\theta$.



Give the sines, cosines, and tangents of the following special angles:

$\sin 30° = \sin \frac{\pi}{6} =$ ____________________

$\cos 30° = \cos \frac{\pi}{6} =$ ____________________

$\tan 30° = \tan \frac{\pi}{6} =$ ____________________

$\sin 45° = \sin \frac{\pi}{4} =$ ____________________

$\cos 45° = \cos \frac{\pi}{4} =$ ____________________

$\tan 45° = \tan \frac{\pi}{4} =$ ____________________

$\sin 60° = \sin \frac{\pi}{3} =$ ____________________

$\cos 60° = \cos \frac{\pi}{3} =$ ____________________

$\tan 60° = \tan \frac{\pi}{3} =$ ____________________

Cofunctions of complementary angles are ______________. If θ is an acute angle, then:

$\sin(90° - \theta) =$ __________ $\cos(90° - \theta) =$ __________

$\tan(90° - \theta) =$ __________ $\cot(90° - \theta) =$ __________

$\sec(90° - \theta) =$ __________ $\csc(90° - \theta) =$ __________

II. Trigonometric Identities (Pages 304–305)

> ***What you should learn***
> How to use the fundamental trigonometric identities

List six reciprocal identities:

1)

2)

3)

4)

5)

6)

List two quotient identities:

1)

2)

List three Pythagorean identities:

1)

2)

3)

III. Evaluating Trigonometric Functions with a Calculator (Page 305)

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

To use a calculator to evaluate trigonometric functions of angles measured in degrees, . . .

Example 2: Use a calculator to evaluate (a) $\tan 35.4°$, and (b) $\cos 3.25°$

IV. Applications Involving Right Triangles (Pages 306–307)

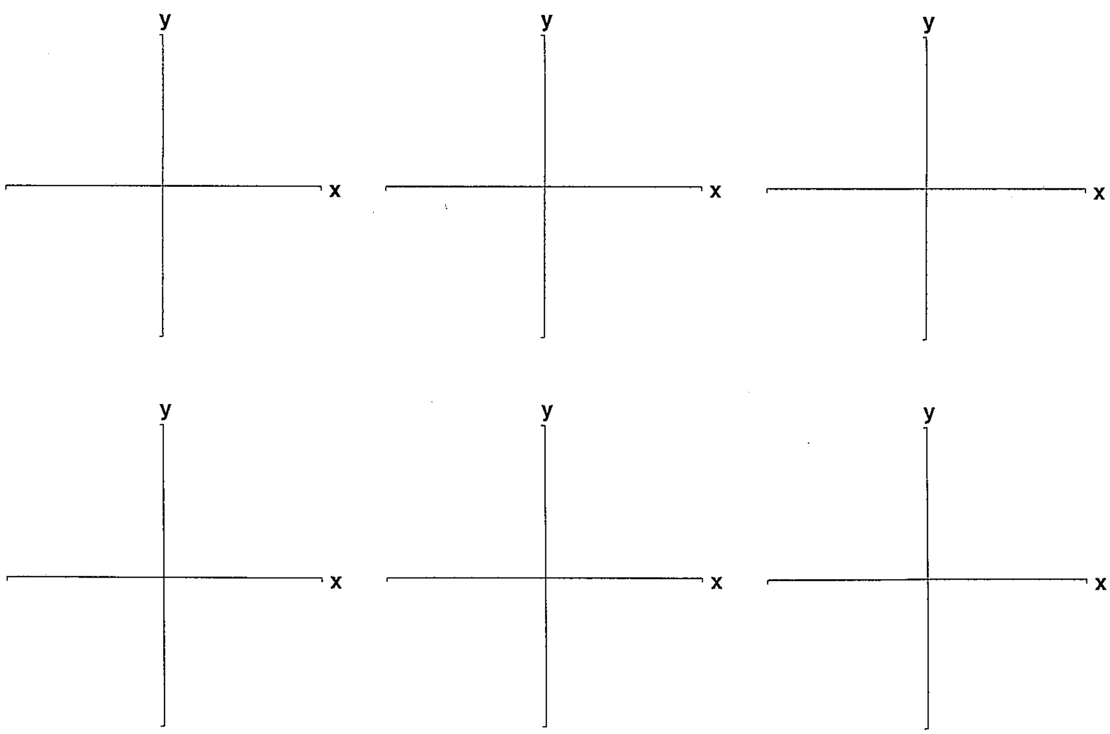
> *What you should learn*
> How to use trigonometric functions to model and solve real-life problems

What does it mean to "solve a right triangle?"

The term **angle of elevation** means . . .

The term **angle of depression** means . . .

Additional notes



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Exercises 41 – 55 odd

Name: ______________

Course Number

Instructor

Date

Section 4.4 Trigonometric Functions of Any Angle

Objective: In this lesson you learned how to evaluate trigonometric functions of any angle.

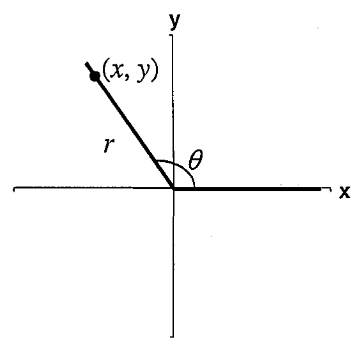
Important Vocabulary Define each term or concept.

Reference angles

I. Introduction (Pages 312–313)

What you should learn
How to evaluate trigonometric functions of any angle

Let θ be an angle in standard position with (x, y) a point on the terminal side of θ and $r=\sqrt{x^2+y^2}\neq 0$. Complete the following definitions of the trigonometric functions of any angle:



$\sin\theta =$ ____________ $\cos\theta =$ ____________

$\tan\theta =$ ____________ $\cot\theta =$ ____________

$\sec\theta =$ ____________ $\csc\theta =$ ____________

Name the quadrants in which the sine function is positive.

____

Name the quadrants in which the sine function is negative.

____

Name the quadrants in which the cosine function is positive.

____

Name the quadrants in which the cosine function is negative.

____

Name the quadrants in which the tangent function is positive.

____

Name the quadrants in which the tangent function is negative.

____

Example 1: If $\sin\theta=\frac{1}{2}$ and $\tan\theta<0$, find $\cos\theta$.

II. Reference Angles (Page 314)

> ***What you should learn***
> How to use reference angles to evaluate trigonometric functions

Example 2: Find the reference angle θ' for
(a) $\theta = 210°$ (b) $\theta = 4.1$

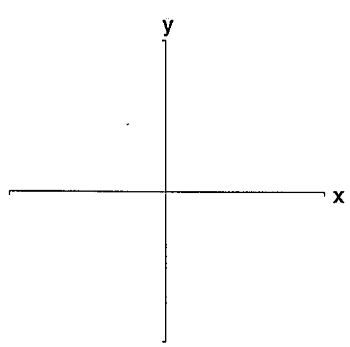
III. Trigonometric Functions of Real Numbers (Pages 315–317)

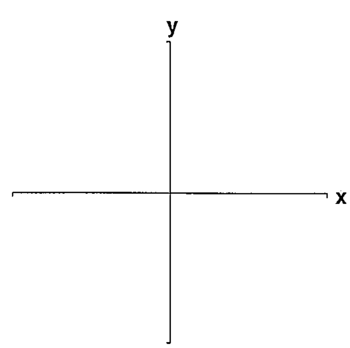
> ***What you should learn***
> How to evaluate trigonometric functions of real numbers

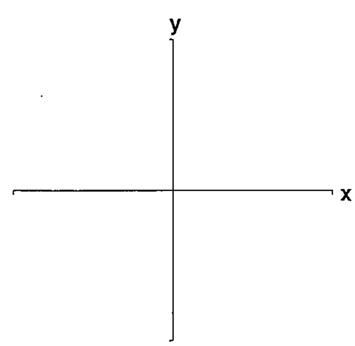
To find the value of a trigonometric function of any angle θ, . . .

Example 3: Evaluate $\sin \frac{11\pi}{6}$.

Example 4: Evaluate $\cos 240°$.







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Exercises 57–85 odd