Basic Identities

Section Objectives: Students will know how to use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions.

We use trig. identities to:

1. Evaluate trig. functions
2. Simplify trig. expressions
3. Develop additional trig. identities
4. Solve trig. Equations

Reciprocal Identities

$$\sin\theta = \frac{1}{\csc\theta} \qquad \cos\theta = \frac{1}{\sec\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \quad , \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1 \quad , \quad 1 + \tan^2\theta = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

The pythagorean identities can also be expressed as radicals

Even/Odd Identities

$\sin(-x) = -\sin x$	$\tan(-x) = -\tan x$	*(odd)*
$\cot(-x) = -\cot x$	$\csc(-x) = -\csc x$	*(odd)*
$\cos(-x) = \cos x$	$\sec(-x) = \sec x$	*(even)*

Ex: If **sec *u* = -5/3** and **tan *u* > 0**, find the values of the other five trigonometric functions.

Ex: Write sec(x) in terms of tan(x).

Ex: Simplify the following.

a. $\sin x \cos^2 x - \sin x$ *(Hint: Factor and use Pythagorean identity)*

b. $\sin t + \cot t \cos t$

c. $\tan t \sin t + \cos t$

d. sec(-x) – sec(x)

Ex: Rewrite so that it is not a fraction.

$$\frac{1}{1+\sin x}$$

Ex: Perform the addition and simplify

$$\frac{\sin\theta}{1+\cos\theta}+\frac{\cos\theta}{\sin\theta}$$

Ex: Factor the following trigonometric expressions.

a. $\cos^2 x - 1$

b. $\sin^2 u - 3\sin u - 10$

c. $4\tan^2 x + \tan x - 3$

d. $\csc^2 x - \cot x - 3$

Ex: Find an equivalent algebraic exression for the composition

a. $\cos\left(\arcsin\left(x\right)\right)$

b. $\tan(\arccos(x))$

Ex: Show that this is **NOT** an identity

$$\tan^2\theta - 1 = \sec^2\theta$$