

Warm-up!

Which one of the following is not equivalent to $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}$?

A) $\sec \theta \csc \theta$

B) $\tan \theta + \cot \theta$

C) $\frac{1}{\sin \theta \cos \theta}$

D) $1 - \sin \theta \cos \theta$

Trig Functions, Day 7

- More Identities (that we kind of already know)
- 3.10, 3.11, 3.12

Homework: Basic Identities

Quiz Next Class

- Solving
- Pythag Identities
- Reciprocal Identities
- Quotient Identities
- $+2\pi k$

Pythagorean Identities

$$\sin^2 \theta + \cos^2 \theta = 1$$

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

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

Reciprocal Identities

$$\sin \theta = \frac{1}{\csc \theta}$$

$$\cos \theta = \frac{1}{\sec \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

Example 1: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$\sin \theta + 2 = 3 \csc \theta$$

Example 2: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$\sec \theta + 3 = -2 \cos \theta$$

Example 3: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$\sin^3 \theta = \csc \theta$$

Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

Example 4: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$2 \cot \theta = \sqrt{3} \csc \theta$$

Example 5: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$2 \csc^2 \theta = 3 \cot \theta \csc \theta + 2$$

Example 6: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$\tan \theta = \frac{\sec \theta}{\cot \theta}$$

Other than the Pythagorean identities, reciprocal identities, and quotient identities, here are some tricks we can do to rewrite trigonometric expressions:

Common Denominator

$$\frac{1}{\cos \theta} - \cos \theta$$

Multiply by Conjugate

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

Difference of Squares

$$\frac{1 - \cos^2 \theta}{1 + \cos \theta}$$

Example 8: Three of the following expressions are equivalent. One is not. Find the one that is not equivalent to the other three.

$$\sin \theta \tan \theta$$

$$\frac{\sin^2 \theta - 1}{\sin \theta}$$

$$\sec \theta - \cos \theta$$

$$\frac{1 - \cos^2 \theta}{\cos \theta}$$

Example 9: Three of the following expressions are equivalent. One is not. Find the one that is not equivalent to the other three.

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

$$\frac{\tan \theta - 1}{\tan \theta + 1}$$

$$\frac{1 - 2 \sin \theta \cos \theta}{\sin^2 \theta - \cos^2 \theta}$$

$$\frac{2 \csc \theta \sec \theta - 1}{\tan^2 \theta - \cot^2 \theta}$$

Example 10: Solve over the interval $0 \leq \theta < 2\pi$. Be careful of values that are outside the domain of these functions.

$$\sec^3 \theta - \tan \theta \sec \theta = 3 \sec \theta + \cos \theta$$