Lesson 73 Objective: SWBAT use trigonometry identities to verify equations.

Kickoff

Complete your participation rubric and put it on my desk!

Complete questions 31-36 in your homework packet!!

31) $\sin \frac{2\pi}{3} =$ ref: 60 $\frac{\sqrt{3}}{2}$ II

32) $\csc \frac{5\pi}{4} =$ $\measuredangle 45$ $\frac{\pi}{4}$ $\sin 45 = \frac{\sqrt{2}}{2}$ $\frac{-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-2\sqrt{2}}{2}$ $-\sqrt{2}$

33) $\tan \pi =$ 0

34) $\cos \frac{2\pi}{3} =$ $-\frac{1}{2}$

35) $\tan \frac{7\pi}{4} =$ -1

36) $\cos 0 =$ 1 (0,1) (-1,0) (1,0) (0,-1)

19) $\sin -300$ $\sin 60 = \frac{\sqrt{3}}{2}$

22) $\tan \frac{3\pi}{2}$ $\frac{-1}{0} =$ DNE $\frac{\pi}{2}$ π 0 $\frac{3\pi}{2}$ (0,-1)

Reciprocal Identities	Quotient Identities:
Csc θ = $\frac{1}{\sin\theta}$	Tan θ = $\frac{\sin\theta}{\cos\theta}$
Sec θ = $\frac{1}{\cos\theta}$	Cot θ = $\frac{\cos\theta}{\sin\theta}$
Cot θ = $\frac{1}{\tan\theta}$	

All the above identities can be Used to Simplify expressions

Examples: Simplify each expression using the identities above.

1) (cscθ)(sinθ)

$\left(\frac{1}{\cancel{\sin\theta}}\right)\left(\frac{\cancel{\sin\theta}}{1}\right)$

1

2) $\sec^2\theta \bullet \cot^2\theta$

$\left(\frac{1}{\cancel{\cos^2\theta}}\right)\left(\frac{\cancel{\cos^2\theta}}{\sin^2\theta}\right)$

$\frac{1}{\sin^2\theta} = \boxed{\csc^2\theta}$

3) 2Secθ + tanθ

$2\left(\frac{1}{\cos\theta}\right)+\left(\frac{\sin\theta}{\cos\theta}\right)$

$\frac{2}{\cos\theta} + \frac{\sin\theta}{\cos\theta}$

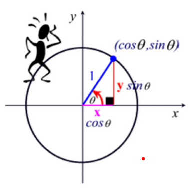
$\boxed{\frac{2+\sin\theta}{\cos\theta}}$

4) $\frac{\csc^4 x \tan^4 x}{\frac{1}{\sin^4 x}}$

$\frac{\cancel{\csc^4 x} \tan^4 x}{\cancel{\csc^4 x}}$

$\boxed{\tan^4 x}$

Pythagorean Identities:



$a^2+b^2=c^2$

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

$\cos^2\theta+\sin^2\theta = 1$ ☆

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

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

There are two more identities that we can derive from $\cos^2\theta + \sin^2\theta = 1$

1) Divide each piece of the equation by $\sin^2\theta$

$\frac{\cos^2\theta}{\sin^2\theta} + \frac{\sin^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

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

Variations:

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

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

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

2) Divide each piece of the equation by $\cos^2\theta$

$\frac{\cos^2\theta + \sin^2\theta = 1}{\cos^2\theta}$

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

Variations:

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

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

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

Before we Begin

Factoring with Trig Functions:

$\cos x - \cos x \sin^2 x$

$\cos x(1 - \sin^2 x)$

$\cos x(\cos^2 x)$

$\cos^3 x$

$\sin^4 x - \cos^4 x$

$(\sin^2 x - \cos^2 x)\cancel{(\sin^2 x + \cos^2 x)}$

$(\sin x - \cos x)(\sin x + \cos x)$

Let $\sin x = a$

$2\sin^2 x - \sin x - 3$

$2a^2 - a - 3$

$2a^2 - 3a + 2a - 3$

$a(2a-3)\ 1(2a-3)$

$(a+1)(2a-3)$

$(\sin x + 1)(2\sin x - 3)$

Working with Conjugates

$(2-x)(2+x)$

$4 - x^2$

$(4x+5)(4x-5)$

$16x^2 - 25$

$(1-\sin x)(1+\sin x)$

$1 - \sin^2 x$

$\cos^2 x$

Breaking up Fractions:

$\frac{x+4}{5}$ $\quad \frac{x}{5} + \frac{4}{5}$

$\frac{\sin x + \cos x}{\cos x}$ $\quad \frac{\sin x}{\cos x} + \frac{\cos x}{\cos x}$ $\quad \tan x + 1$

$\frac{\csc x + \sec x}{\csc x \sec x}$ $\quad \frac{\cancel{\csc x}}{\cancel{\csc x}\sec x} + \frac{\cancel{\sec x}}{\csc x \cancel{\sec x}}$ $\quad \frac{1}{\sec x} + \frac{1}{\csc x}$ $\quad \cos x + \sin x$

Finding Common Denominators:

$\frac{2x}{x+3} + \frac{7x}{x-3}$ $\qquad \frac{1}{1+\cos x} + \frac{1}{1-\cos x}$ $\qquad \frac{\sin x}{\cos x + 1} + \frac{\cos x - 1}{\sin x}$

Lesson 72 Objective: SWBAT verify trig functions.

Kickoff

Simplify the following:

1) $\frac{\sin\theta \csc\theta}{\cot\theta}$ $\quad$ 2) $\cancel{\cos^2\theta + \sin^2\theta} + \tan^2\theta$ $\quad$ 3) $(1+\cos\theta)(1-\cos\theta)$

$\frac{\sin\theta \cdot \frac{1}{\sin\theta}}{\frac{\cos\theta}{\sin\theta}}$ $\quad \frac{1}{\frac{\cos\theta}{\sin\theta}} \rightarrow \frac{1}{\cot\theta}$ $\quad \tan\theta$

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

$1 - \cos^2\theta$ $\quad \sin^2\theta$

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

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

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

Verifying Trig Equations:

You are only allowed to simplify ONE side of the equal sign to get it to look like the other.

- You cannot move across the = sign and you usually start with the more complicated side.

Different Methods to Simplify:

1) Rewrite the more complicated side using Sin and Cos
2) Factor
3) Break up a single fraction into two
4) Common Denominator
5) Using the Conjugate

Rewrite using Sin and Cos

$\csc x - \cot x \cos x = \sin x$

$\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\cdot\frac{\cos\theta}{1} = \sin\theta$

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

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

$\frac{\sin^2\theta}{\sin\theta} = \sin\theta$

$\sin\theta = \sin\theta$ ✓

Factor

$\sin x - \sin x \cos^2 x = \sin^3 x$

$\sin x(1 - \cos^2 x) = \sin^3 x$

$\sin x(\sin^2 x) = \sin^3 x$

$\sin^3 x = \sin^3 x$

Break up a single fraction into two

$\frac{\sec x - \csc x}{\sec x \csc x} = \sin x - \cos x$

$\frac{\cancel{\sec x}}{\cancel{\sec x}\csc x} - \frac{\cancel{\csc x}}{\sec x \cancel{\csc x}}$

$\frac{1}{\csc x} - \frac{1}{\sec x}$

$\sin x - \cos x$

Common Denominator

$\frac{(1-\cos x)}{(1-\cos x)}\cdot\frac{1}{1+\cos x} + \frac{1}{1-\cos x}\cdot\frac{(1+\cos x)}{(1+\cos x)} = 2\csc^2 x$

$\frac{1(1-\cos x) + 1(1+\cos x)}{(1-\cos x)(1+\cos x)}$ $\quad 1 - \cancel{\cos x} + 1 + \cancel{\cos x}$

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

$\frac{2}{\sin^2 x} = \boxed{2\csc^2 x}$ ✓

Using the Conjugate *of the denominator*

$$\frac{1}{\sec x - \tan x} \cdot \frac{(\sec x + \tan x)}{(\sec x + \tan x)} = \tan x + \sec x$$

$$\frac{1(\sec x + \tan x)}{(\sec x - \tan x)(\sec x + \tan x)}$$

$$\frac{\sec x + \tan x}{\cancel{\sec^2 x - \tan^2 x}\ 1}$$

$$\sec x + \tan x = \sec x + \tan x \checkmark$$

Using the Conjugate *of the numerator*

$$\frac{\tan x}{1+\cos x} = \frac{1-\cos x}{\sin x \cos x} \cdot \frac{(1+\cos x)}{(1+\cos x)}$$

$$= \frac{1-\cos^2 x}{\sin x \cos x(1+\cos x)}$$

$$= \frac{\sin^{\cancel{2}} x}{\cancel{\sin x}\cos x(1+\cos x)}$$

$$= \frac{\sin x}{\cos x(1+\cos x)}$$

$$\frac{\tan x}{1+\cos x}$$