

Identities & Proof



Jan 3 - 7:15 AM

#9 & 10 from yesterday's notes are posted online.

Warm-up: Simplify $\tan x + \cot x$

Add this to your note sheet with other WU

Questions

Jan 23-7:25 AM

Worksheet 7.2

$$\frac{\sin^2 x + \cos^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} \rightarrow \tan^2 x + 1 = \sec^2 x$$

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

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

2. $\sin x - \sec x$

3. $\sec^2 x + 2\tan x$

4. $\cos^2 x$

5. $(\tan x - \cot x)(\tan x + \cot x)$

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

7. $(\sin x + 3)(\sin^2 x - 3\sin x + 9)$

8. $\sec x$

9. 1

10. $\cot^2 x$

$$\textcircled{9} \frac{\sec^2 x}{\tan^2 x} - \frac{1}{\tan^2 x} = \frac{\sec^2 x - 1}{\tan^2 x} = \frac{\tan^2 x}{\tan^2 x} = \textcircled{1}$$

Jan 22-3:17 PM

Warm-up:

Simplify $\tan x + \cot x$

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

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

$$= \textcircled{\sec x \csc x}$$

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Warm-Up: Simplify

$$1. \frac{\cot x}{\csc x} = \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}}$$

$$= \frac{\cos x}{\sin x} \cdot \frac{\sin x}{1}$$

$$= \cos x$$

$$= \frac{\cos x \cancel{\sin x}}{\cancel{\sin x}}$$

$$\frac{\cos x \cancel{\sin x}}{\cancel{\sin x}}$$

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

$$2. \frac{\csc x - \sin x}{\cos x}$$

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

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

$$= \cot x$$

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TRIG IDENTITIES

- Work on the more complicated side
- Substitute to get expressions in terms of sin and cos
 - Factor, find common denominators
- Look for Pythagorean identities when terms are squared and have 1 in the expression
- This is not an equation – do not move terms from 1 side to the other or try to multiply or divide both sides by any terms

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$$\begin{array}{l} \tan x \cos x = \sin x \\ \frac{\sin x}{\cos x} \cdot \frac{\cos x}{1} = \sin x \\ \sin x = \sin x \end{array}$$

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$$\begin{array}{l} \tan x \csc x = \sec x \\ \frac{\sin x}{\cos x} \cdot \frac{1}{\sin x} = \sec x \\ \frac{1}{\cos x} = \sec x \\ \sec x = \sec x \end{array}$$

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$$\begin{array}{lcl}
 \frac{\tan x}{\sec x} & = & \sin x \\
 \frac{\frac{\sin x}{\cos x}}{\frac{1}{\cos x}} & = & \\
 \frac{\sin x}{\cancel{\cos x}} \cdot \frac{\cancel{\cos x}}{1} & = & \\
 \sin x & = & \sin x \\
 & \checkmark &
 \end{array}$$

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$$\begin{array}{lcl}
 \sin^2 x - \tan^2 x & = & -\sin^2 x \tan^2 x \\
 \frac{\cos^2 x \left(\frac{\sin^2 x}{1} \right) - \frac{\sin^2 x}{\cos^2 x}}{\cos^2 x} & = & \\
 \frac{\sin^2 x \cos^2 x - \frac{\sin^2 x}{\cos^2 x}}{\cos^2 x} & = & \\
 \frac{\sin^2 x \cos^2 x - \sin^2 x}{\cos^2 x} & = & \\
 \frac{\sin^2 x (\cos^2 x - 1)}{\cos^2 x} & = & \\
 \frac{\tan^2 x (\cos^2 x - 1)}{\tan^2 x (-\sin^2 x)} & = & \\
 -\sin^2 x \tan^2 x & = & -\sin^2 x \tan^2 x \\
 & \checkmark &
 \end{array}$$

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

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* See next
slide for
alternative
solution

$$\begin{aligned}
 \sec^2 x - \csc^2 x &= \tan^2 x - \cot^2 x \\
 &= \frac{\sin^2 x}{\cos^2 x} - \frac{(\cos^2 x)(\cos^2 x)}{\sin^2 x} \\
 &= \frac{\sin^4 x - \cos^4 x}{\sin^2 x \cos^2 x} \\
 &= \frac{(\sin^2 x - \cos^2 x)(\sin^2 x + \cos^2 x)}{\sin^2 x \cos^2 x} \\
 &= \frac{(\sin x + \cos x)(\sin x - \cos x)}{\sin^2 x \cos^2 x} \\
 &= \frac{\sin^2 x}{\sin^2 x \cos^2 x} - \frac{\cos^2 x}{\sin^2 x \cos^2 x} \\
 \sec^2 x - \csc^2 x &= \sec^2 x - \csc^2 x
 \end{aligned}$$

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$$\begin{aligned}
 5) \quad \sec^2 x - \csc^2 x &= \tan^2 x - \cot^2 x \\
 1 + \tan^2 x - (1 + \cot^2 x) & \\
 \cancel{1} + \tan^2 x - \cancel{1} - \cot^2 x &= \tan^2 x - \cot^2 x
 \end{aligned}$$

Homework 7-6

Worksheet 7.1 #21

Worksheet 7.3 #1-10

Test Tuesday 2/4

Graded #12 due Wednesday 2/5

Jan 6-8:34 AM

Jan 22-3:54 PM