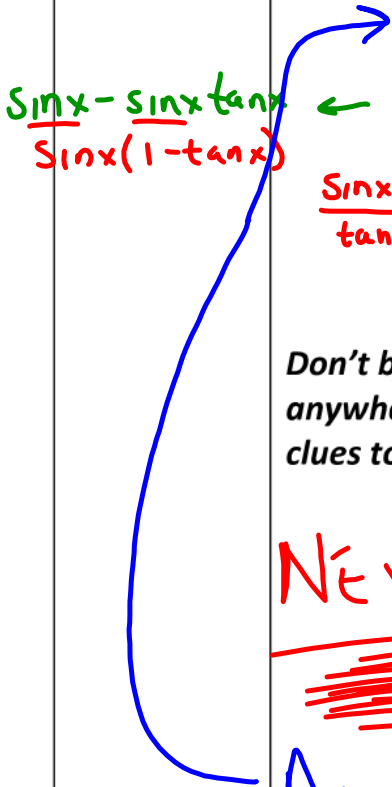


<p>Trigonometric Identities Students will learn to verify trigonometric identities</p>	<p>Precalculus/Honors Precalculus</p>
<p>What are the reciprocal identities?</p> <p>What are the quotient identities?</p> <p>What are the Pythagorean identities?</p> <p>What are the Odd-Even Identities</p>	<p>FUNDAMENTAL IDENTITIES</p> <p>Reciprocal Identities:</p> $\csc \theta = \frac{1}{\sin \theta} \quad \sec \theta = \frac{1}{\cos \theta} \quad \cot \theta = \frac{1}{\tan \theta}$ $\sin \theta = \frac{1}{\csc \theta} \quad \cos \theta = \frac{1}{\sec \theta} \quad \tan \theta = \frac{1}{\cot \theta}$ <p>Quotient Identities:</p> $\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$ <p>Pythagorean Identities:</p> $\cos^2 \theta + \sin^2 \theta = 1 \quad \rightarrow \quad \begin{matrix} \cos^2 \theta + \sin^2 \theta = 1 \\ -\sin^2 \theta \quad -\sin^2 \theta \end{matrix}$ $\cos^2 \theta = 1 - \sin^2 \theta$ $\sin^2 \theta = 1 - \cos^2 \theta$ $1 + \tan^2 \theta = \sec^2 \theta$ $\cot^2 \theta + 1 = \csc^2 \theta$ <p>Even - Odd Identities</p> $\sin(-x) = -\sin x \quad \cos(-x) = \cos x \quad \tan(-x) = -\tan x$ $\csc(-x) = -\csc x \quad \sec(-x) = \sec x \quad \cot(-x) = -\cot x$

<p>Trigonometric Identities Students will learn to verify trigonometric identities</p>	<p>Precalculus/Honors Precalculus</p>
<p>How do you verify identities?</p>	<p>Guidelines for Verifying Trigonometric Identities</p> <ul style="list-style-type: none"> • Start with the more complicated side, work step-by step to transform it to the simpler side. • Look for opportunities to apply the fundamental identities. • Use one or more of the following techniques: <ul style="list-style-type: none"> ● Rewrite the more complicated side in terms of $\sin x$ and $\cos x$. ○ Factor out the greatest common factor. ○ Separate a single-term quotient terms: <p><i>Don't be afraid to stop and start over if you are not getting anywhere. Strategies leading to dead ends often provide clues to the solution.</i></p> <p>NEVER GIVE UP !!!!!!!</p> <p>.....</p> <p>ALWAYS TRY <u>SOMETHING</u> !!</p>

$$\frac{\sin x - \sin x \tan x}{\sin x (1 - \tan x)}$$

$$\frac{\sin x + 1}{\tan x} = \frac{\sin x}{\tan x} + \frac{1}{\tan x} \quad \frac{a + b}{c} = \frac{a}{c} + \frac{b}{c}$$



Trigonometric Identities

Precalculus/Honors Precalculus

Students will learn to verify trigonometric identities

How do you verify an identity by replacing all terms with $\sin x$ or $\cos x$?

Example 1: Verify the expression.

$$\frac{\cancel{\sin x} \tan x}{\cancel{\sin x}} = \sec x$$

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

$$\sec x = \sec x \quad \checkmark$$

Example 2: Verify the expression.

$$\sin x \tan x + \cos x = \sec x$$

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

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

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

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

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

$$\sec x = \sec x \quad \checkmark$$

How do you use factoring to verify an identity?

Example 3: Verify the expression.

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

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

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

$$\sin^3 x = \sin^3 x \quad \checkmark$$

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

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

<p>Trigonometric Identities Students will learn to verify trigonometric identities</p>	<p>Precalculus/Honors Precalculus</p>
<p>How do you use multiple steps to verify an identity?</p>	<p>Example 4: Verify the identity.</p> $\frac{1 + \sin x}{\cos x} = \sec x + \tan x$ <p>Handwritten work:</p> $\frac{1 + \sin x}{\cos x} = \frac{1}{\cos x} + \frac{\sin x}{\cos x}$ $\frac{1 + \sin x}{\cos x} = \frac{1 + \sin x}{\cos x}$ <p>Final result:</p> $\frac{1 + \sin x}{\cos x} = \sec x + \tan x$
<p>How do you combine fractional expressions to verify an identity?</p>	<p>Example 5: Verify the identity.</p> $\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = 2 \csc x$ <p>Handwritten work:</p> <p>Com. Den.</p> $\frac{(1 + \cos x) \sin x}{\sin x (1 + \cos x)} + \frac{\sin x (1 + \cos x)}{\sin x (1 + \cos x)} = 2 \csc x$ $\frac{\sin^2 x + 1 + 2 \cos x + \cos^2 x}{\sin x (1 + \cos x)} = 2 \csc x$ $\frac{1 + 1 + 2 \cos x}{\sin x (1 + \cos x)} = 2 \csc x$ $\frac{2 + 2 \cos x}{\sin x (1 + \cos x)} = 2 \csc x$ $\frac{2(1 + \cos x)}{\sin x (1 + \cos x)} = 2 \csc x$

Handwritten work below the table:

$$\frac{2}{\sin x} = 2 \csc x$$

$$2 \cdot \frac{1}{\sin x} = 2 \csc x \quad \text{woo hoo!!}$$

$$2 \csc x = 2 \csc x \quad \checkmark$$

Trigonometric Identities

$(x+3)(x-3)$

Precalculus/Honors Precalculus

Students will learn to verify trigonometric identities

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

How do you verify an identity by multiplying the numerator and the denominator by the same factor?

Example 6: Verify the identity.

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

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

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

Example 7: Verify the identity.

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

$\frac{\sec x - \csc x}{\sec x \csc x}$
 $\frac{\frac{1}{\cos x} - \frac{1}{\sin x}}{\frac{1}{\cos x} \cdot \frac{1}{\sin x}}$
 $\frac{\sin x - \cos x}{1 \cdot \sin x \cos x}$
 $\frac{1}{\sin x \cos x}$

$\sin x - \cos x = \sin x - \cos x$

Verify each identity.

1. $\sin x \sec x = \tan x$

2. $\cos x \csc x = \cot x$

3. $\tan x \cos x = \sin x$

4. $\cot x \sin x = \cos x$

5. $\sin x \tan x \cos x = \sin^2 x$

6. $\sin x \cot x \cos x = \cos^2 x$

7. $\sec x - \sec x \sin^2 x = \cos x$

8. $\csc x - \csc x \cos^2 x = \sin x$

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

10. $\csc \theta - \sin \theta = \cot \theta \cos \theta$

11. $\frac{\tan \theta \cot \theta}{\csc \theta} = \sin \theta$

12. $\sin^2 x (1 + \cot^2 x) = 1$

13. $\sin t \tan t = \frac{1 - \cos^2 t}{\cos t}$

14. $\frac{\csc^2 t}{\cot t} = \csc t \sec t$

15. $\cos x(\tan x + \sin x \cot x) = \sin x + \cos^2 x$

16. $\frac{1 - \sin \theta}{\cos \theta} = \sec \theta - \tan \theta$

 $\frac{\sin t}{\tan t} + \frac{\cos t}{\cot t} = \sin t + \cos t$

$$18. \quad 1 - \frac{\sin^2 x}{1 + \cos x} = \cos x$$

$$22. \quad \frac{(1 - \cos u)(1 + \cos u)}{\cos^2 u} = \tan^2 u$$

$$19. \quad \csc^2 x \sec x = \sec x + \csc x \cot x$$

$$23. \quad \frac{(1 + \tan^2 x)}{\sin^2 x + \cos^2 x} = \sec^2 x$$

$$20. \quad \sin^2 \beta (1 + \cot^2 \beta) = 1$$

$$24. \quad \tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$$

$$21. \quad (\sec \theta + 1)(\sec \theta - 1) = \tan^2 \theta$$

