

Verifying Trigonometric Identities

Guidelines for
Verifying Trig
Identities

1. work with ONE side only
2. use algebraic technique
(factor, add fractions, monomial denominators)
- * Multiply by conjugate
3. substitute using basic identities
4. convert everything to sin & cos
5. TRY SOMETHING!!

Example 1:

Verify $\overset{\text{Start}}{\frac{\csc^2 x}{\cot x}} = \overset{\text{End}}{\csc x \sec x}$

$$\frac{\csc^2 x}{\cot x}$$

$$= \csc x \cdot \frac{\csc x}{\cot x}$$

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

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

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

$$= \csc x \sec x$$

Verifying Trig Identities

Example 2:

$$\text{Verify } \frac{\tan \theta}{1 + \sec \theta} + \frac{1 + \sec \theta}{\tan \theta} = 2 \csc \theta$$

start End

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

mult.
by
conjugate

$$\frac{\tan \theta (1 - \sec \theta)}{1 - \sec^2 \theta} + \frac{1 + \sec \theta}{\tan \theta}$$

move the
negative

$$\frac{\tan \theta (1 - \sec \theta)}{-\tan^2 \theta} + \frac{1 + \sec \theta}{\tan \theta}$$

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

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

$$\frac{2 \sec \theta}{\tan \theta} = \frac{2/\cos \theta}{\sin \theta/\cos \theta} = \frac{2}{\cos \theta} \cdot \frac{\cos \theta}{\sin \theta} = \frac{2}{\sin \theta} = 2 \csc \theta$$

Example 3:

$$\text{Verify } \frac{\cot^3 t}{\csc t} = \csc t (\csc^2 t - 1)$$

start End

$$\frac{\cot^3 t}{\csc t}$$

$$\frac{\cos^3 t / \sin^3 t}{1/\sin t}$$

$$\frac{\cos^3 t}{\sin^3 t} \cdot \frac{\sin t}{1}$$

$$\frac{\cos^3 t}{\sin^2 t}$$

$$\csc t \cdot \frac{\cos^2 t}{\sin^2 t}$$

$$\csc t \cot^2 t$$

$$\csc t (\csc^2 t - 1)$$