MHF 4UI Date:

Tips & Tricks for Proving Trig Identities

1. Start by separating left side (LS) from right side (RS).

2. Generally, it is best to choose the side that is more complicated/more terms to work on first. Keep checking the other side so you know what you are working towards.

3. Often (*but not always!*) it is helpful to write everything in terms of sine and cosine functions first.

4. Know the basic identities listed below. Make the appropriate substitution(s) where necessary.

Basic Identities:

$\tan x = \dfrac{\sin x}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$ $\csc x = \dfrac{1}{\sin x}$ $\sec x = \dfrac{1}{\cos x}$

Pythagorean Identities:	**Variations:**	
$\sin^2 x + \cos^2 x = 1$	$\sin^2 x = 1 - \cos^2 x$	$\cos^2 x = 1 - \sin^2 x$
$1 + \cot^2 x = \csc^2 x$	$\cot^2 x = \csc^2 x - 1$	$\csc^2 x - \cot^2 x = 1$
$\tan^2 x + 1 = \sec^2 x$	$\tan^2 x = \sec^2 x - 1$	$\sec^2 x - \tan^2 x = 1$

5. Try other algebraic techniques to manipulate the expression such as:
   a) Multiply terms using distributive property.
   b) Get a common denominator to combine terms.
   c) Factor. (Look for common factor, difference or sum of squares).
   d) Change division of a rational expression to multiplication of the reciprocal.
   e) Multiply by "a clever form of 1" (ie. a rational expression with numerator = denominator)

6. Keep trying! Often the proof is not obvious from the beginning. Start by trying one step, which will usually lead to another step, and hopefully to the final answer.

7. Remember that many identities can be proven many different ways. There is not always just **one** correct answer, but many different (and correct) approaches.

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Trig Identities – Prove the following:

1) $1-\cos^2\theta=\cos^2\theta\tan^2\theta$

2) $\sec\theta(1+\cos\theta)=1+\sec\theta$

3) $\dfrac{1}{1-\sin x}-\dfrac{1}{1+\sin x}=\dfrac{2\tan x}{\cos x}$

4) $\dfrac{\cos\theta}{1-\sin\theta}=\dfrac{1+\sin\theta}{\cos\theta}$