Section 5.2 **Verifying Identities**

An **identity** is an equation that is ALWAYS true for ANY angle.

To verify that an equation is really an identity:

Step 1) Pick ONE side of the equation to work with. Usually it is best to start with the more complicated looking side.

Step 2) Use the fundamental identities to change it to look like the other side.

Some Strategies to try:

- Rewrite everything to be in terms of sine and cosine.
- Use the Pythagorean identities if you see a trig function squared. Keep in mind that the Pythagorean identities can be written several ways.
- ONE FRACTION?
  - Try splitting a single fraction into two fractions.
  - Try multiplying both the numerator and the denominator by the conjugate of the denominator.
- TWO FRACTIONS?
  - Try combining two fractions, by giving them the same denominator.
- COMPLEX FRACTION?
  - Try converting it into a simplex fraction by multiplying by the LCD of all the "mini fractions."
- Factor
  - Difference of squares? $A^2 - B^2 \; factors \; as \; (A-B)(A+B)$
  - Three terms? Factors like a trinomial.
- Multiply
  - Distribute
  - FOIL

NOTE:

Verifying Identities is challenging and takes a lot of practice and patience. They are not supposed to be "easy."

There may be many different ways to verify a particular identity, so if one approach doesn't seem to get you anywhere try another approach.

DO SOMETHING! Often just starting to do something will help you to see how the two sides are connected.

Example: Verify the following identities.

a) $\frac{\cot\theta}{\csc\theta} = \cos\theta$

b) $\cot\theta + \tan\theta = \sec\theta\csc\theta$

c) $\sin^4 \theta - \cos^4 \theta = 2\sin^2 \theta - 1$

d) $\dfrac{1}{1-\sin\theta} + \dfrac{1}{1+\sin\theta} = 2\sec^2 \theta$

e) $$\frac{\cot\alpha+1}{\cot\alpha-1}=\frac{1+\tan\alpha}{1-\tan\alpha}$$

f) $$\frac{1-\sin\theta}{1+\sin\theta}=\sec^2\theta-2\sec\theta\tan\theta+\tan^2\theta$$

g) $$\frac{\tan x}{1+\cos x}+\frac{\sin x}{1-\cos x}=\cot x+\sec x\csc x$$

h) $(1 - \cos^2 \alpha)(1 + \cos^2 \alpha) = 2 \sin^2 \alpha - \sin^4 \alpha$