Unit 4.1-4.2 Notes Using Trigonometric Identities

Reciprocal Identities

#1 $\sin\theta = \frac{1}{\csc\theta}$ **#2** $\cos\theta = \frac{1}{\sec\theta}$ **#3** $\tan\theta = \frac{1}{\cot\theta}$

#4 $\csc\theta = \frac{1}{\sin\theta}$ **#5** $\sec\theta = \frac{1}{\cos\theta}$ **#6** $\cot\theta = \frac{1}{\tan\theta}$

Quotient Identities

#7 $\tan\theta = \frac{\sin\theta}{\cos\theta}$ **#8** $\cot\theta = \frac{\cos\theta}{\sin\theta}$

Pythagorean Identities

#9a $sin^2\theta + cos^2\theta = 1$
#9b $sin^2\theta = 1 - cos^2\theta$
#9c $cos^2\theta = 1 - sin^2\theta$

#10a $1 + tan^2\theta = sec^2\theta$
#10b $tan^2\theta = sec^2\theta - 1$
#10c $1 = sec^2\theta - tan^2\theta$

#11a $1 + cot^2\theta = csc^2\theta$
#11b $cot^2\theta = csc^2\theta - 1$
#11c $1 = csc^2\theta - cot^2\theta$

Keep Switch Flip

KSF $\frac{\frac{A}{B}}{\frac{C}{D}}$ Rewrite: $\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \times \frac{D}{C}$

Guidelines for verifying a Trigonometric Identity:

1. Check whether the statement is false.
    - This is easily done on a graphing calculator. Graph both sides of the identity and check to see if you get the same picture.
2. Only manipulate one side of the proposed identity until it becomes the other side of the identity.
    - Typically the more complicated side is the best place to start. That side will give you more to work with.
3. **DO NOT** treat the identity like an equation.
    - This assumes that the identity is true, which is the thing that you are trying to prove.

Here are four common tricks that are used to verify an identity.

1. It is often helpful to rewrite things in terms of sine and cosine.
    a. Use the ratio identities to do this where appropriate.
2. Manipulate the Pythagorean Identities.
    a. For example, since $\sin^2 x + \cos^2 x = 1$, then $\cos^2 x = 1 - \sin^2 x$, and $\sin^2 x = 1 - \cos^2 x$.
3. Use algebraic manipulations.
    a. Factor
    b. Find a common denominator
    c. Multiply the numerator and denominator by a conjugate
4. Use an additional trigonometric formula.
    a. Sum or difference formula
    b. Double-angle formula
    c. Half-angle formula