UNIT 3: TRIGONOMETRIC IDENTITIES

MA3A5. Students will establish the identities and use them to simplify trigonometric expressions and verify equivalence statements.

LG 3-1 Simplifying & Verifying Identities

LG 3-2 Applying Trig Identities

What is a trigonometric identity?

- A **trigonometric identity** is a trigonometric equation that is valid for all values of the variables for which the expression is defined.
- In this unit, you will be manipulating expressions to make them equal something
- When simplifying, you won't know the answer
- When verifying, you have the answer and your job is to manipulate one side of an equation to make it look like the other side

Reciprocal Identities

Booklet pg 1

$\sin\theta = \frac{1}{\csc\theta}$	$\cos\theta = \frac{1}{\sec\theta}$	$\tan\theta = \frac{1}{\cot\theta}$
$\csc\theta = \frac{1}{\sin\theta}$	$\sec\theta = \frac{1}{\cos\theta}$	$\cot\theta = \frac{1}{\tan\theta}$

Also work with powers… $\sin^2\theta = \frac{1}{\csc^2\theta}$

Quotient Identities

Booklet pg 2

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

tan

$$\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{\csc\theta}{\sec\theta}$$

Pythagorean Identities

Booklet pgs 3-4

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

$\tan^2\theta + 1 = \sec^2\theta$

$\cot^2\theta + 1 = \csc^2\theta$

Sum and Difference Identities

Booklet pg 5

$$\sin(a \pm b) = \sin(a)\cos(b) \pm \sin(b)\cos(a)$$

The identity above is a short hand method for writing two identities as one. When these identities are broken up, they look like:

$$\sin(a + b) = \sin(a)\cos(b) + \sin(b)\cos(a)$$

$$\sin(a - b) = \sin(a)\cos(b) - \sin(b)\cos(a)$$

$$\cos(a \pm b) = \cos(a)\cos(b) \mp \sin(a)\sin(b)$$

The identity above is a short hand method for writing two identities as one. When these identities are broken up, they look like:

$$\cos(a + b) = \cos(a)\cos(b) - \sin(a)\sin(b)$$

$$\cos(a - b) = \cos(a)\cos(b) + \sin(a)\sin(b)$$

Double-Angle Identities

Booklet pg 6

$\sin(2x) = 2\sin x \cos x$

$$\begin{aligned}\cos(2x) &= \cos^2 x - \sin^2 x \\ &= 2\cos^2 x - 1 \\ &= 1 - 2\sin^2 x\end{aligned}$$