### Advanced Algebra II
#### Trigonometry “Identities”

<table>
<thead>
<tr>
<th>Day #</th>
<th>Section, Title</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simplifying Trig Expressions</td>
<td>Worksheet 1</td>
</tr>
<tr>
<td>2</td>
<td>Simplifying Puzzle</td>
<td>Matching Worksheet</td>
</tr>
<tr>
<td>3</td>
<td>Intro Verifying Trig Identities</td>
<td>Worksheet 2</td>
</tr>
<tr>
<td>4</td>
<td>Verifying Trig Identities</td>
<td>Worksheet 3</td>
</tr>
<tr>
<td>5</td>
<td>Trig Identities Review</td>
<td>Review Worksheet</td>
</tr>
<tr>
<td>6</td>
<td>Trig Identities Test</td>
<td></td>
</tr>
</tbody>
</table>

**Homework is your practice time, make it worthwhile.**
**Assignments are subject to change.**

**WORK HARD. HELP SOMEONE. HAVE FUN**
Reciprocal Identities

**csc A** = \( \frac{1}{\sin A} \)

**sin A** = \( \frac{1}{\csc A} \)

**sec A** = \( \frac{1}{\cos A} \)

**cos A** = \( \frac{1}{\sec A} \)

**cot A** = \( \frac{1}{\tan A} \)

**tan A** = \( \frac{1}{\cot A} \)

Quotient Identities

**tan A** = \( \frac{\sin A}{\cos A} \)

**cot A** = \( \frac{\cos A}{\sin A} \)

Pythagorean Identities

**cos^2 A** = 1 - **sin^2 A**

**sin^2 A** = 1 - **cos^2 A**

**cos^2 A + sin^2 A = 1**

**1 + tan^2 A = sec^2 A**

**1 + cot^2 A = csc^2 A**

**1 = sec^2 A - tan^2 A**

**1 = csc^2 A - cot^2 A**
Advanced Algebra
TRIG NOTES – DAY ONE
Simplifying Trigonometric Expressions

Learning Target: Students will be able to simplify trigonometric expressions
Students will be able to verify trigonometric identities.

To simplify a trigonometric expression that contains trigonometric functions means that the expression is written as a constant (number) or in terms of a single trigonometric function, if possible.

Simplify.

1.) \( \sin \theta \cdot \sec \theta \)

\[
\begin{align*}
\sin \theta \cdot \frac{1}{\cos \theta} &= \frac{\sin \theta}{\cos \theta} \\
&= \tan \theta 
\end{align*}
\]

2.) \( \frac{\sin \theta \cdot \tan \theta}{\cos \theta} \)

\[
\begin{align*}
\frac{\sin \theta}{\cos \theta} \cdot \tan \theta &= \tan \theta \cdot \tan \theta \\
&= \tan^2 \theta 
\end{align*}
\]

3.) \( \cot^2 \theta (1 + \tan^2 \theta) \)

\[
\begin{align*}
\cot^2 \theta (\sec^2 \theta) &= \frac{\cos^2 \theta}{\sin^2 \theta} \cdot \frac{1}{\cos^2 \theta} \\
&= \frac{1}{\sin^2 \theta} \\
&= \csc^2 \theta 
\end{align*}
\]

4.) \( \frac{\sec \theta}{\sin \theta (1 - \cos^2 \theta)} \)

\[
\begin{align*}
\frac{\sec \theta}{\sin \theta (\sin^2 \theta)} &= \frac{\sec \theta \sin \theta}{\sin \theta} \\
&= \sec \theta \sin \theta \\
&= \frac{1}{\cos \theta} \cdot \sin \theta \\
&= \frac{\sin \theta}{\cos \theta} = \tan \theta 
\end{align*}
\]

DAY TWO – PUZZLE ACTIVITY INSTEAD OF NOTES
Advanced Algebra
TRIG NOTES- DAY THREE
Simplifying Trigonometric Expressions

Learning Target: Students will be able to simplify trigonometric expressions
Students will be able to verify trigonometric identities.

To verify trigonometric identities pick one side and transform it so that it is identical to the other.

Tips:
1. Draw a line dividing the equation into 2 parts. (At the equal sign)
2. Look at each side and decide which side you can change the most on. (usually looks the hardest)
3. Work on one side, usually the more complicated one.
4. Use algebra to help you solve. Such as:
   A. Finding a common denominator between terms
   B. Adding/Subtracting/Multiplying fractions
   C. Using Reciprocal functions
   D. Simplifying Complex Fractions
   E. Foil/Factor
5. Substitute basic identities
A HELPFUL TECHNIQUE IS TO TURN EVERYTHING TO BE IN TERMS OF SIN AND COSINE

Verify.

1.) \( \tan x \cdot \cot x = 1 \)
   
   \[
   \frac{\tan x}{\frac{1}{\tan x}} = \tan x \cdot \frac{\tan x}{1} = 1 \sqrt{\square}
   \]

3.) \( \frac{\sin^2 x}{\cos x} + \cos x = \sec x \)
   
   \[
   \frac{\sin^2 x + \cos^2 x}{\cos x} = \frac{1}{\cos x} = \sec x \sqrt{\square}
   \]

2.) \( \sec x - \frac{\sin^2 x}{\cos x} = \cos x \)
   
   \[
   \frac{1}{\cos x} - \frac{\sin^2 x}{\cos x} = \frac{1 - \sin^2 x}{\cos x} = \frac{\cos^2 x}{\cos x} = \cos x \sqrt{\square}
   \]

4.) \( \frac{1 - \sin^2 x}{\csc^2 x - 1} = \sin^2 x \)
   
   \[
   \frac{\cos^2 x}{\csc^2 x - 1} = \frac{\cos^2 x}{\cot^2 x} = \cos^2 x = \frac{\cos x}{\sin x} \sqrt{\square}
   \]
Learning Target: Students will be able to simplify trigonometric expressions
Students will be able to verify trigonometric identities.

1. \[ \frac{\tan x \sin x + \cos x}{\cos x} = \sec x \]
   \[ \frac{\sin x}{\cos x} \cdot \sin x + \cos x \]
   \[ = \frac{\sin^2 x + \cos x}{\cos x} \]
   \[ = \frac{\sin^2 x + \cos^2 x}{\cos x} \]
   \[ = \frac{\sin^2 x + 1 - \sin^2 x}{\cos x} \]
   \[ = \frac{1}{\cos x} \]
   \[ = \sec x \]

2. \[ (1 - \sin x)(1 + \sin x) = \frac{1}{\sec^2 x} \]
   \[ |1 + \sin x - \sin x - \sin^2 x| \]
   \[ = |\sin^2 x| \]
   \[ = \cos^2 x \]
   \[ = \frac{1}{\sec^2 x} \]

3. \[ \frac{\tan x}{\sin x} = \sec x \]
   \[ \tan x \div \sin x \]
   \[ = \tan x \cdot \frac{1}{\sin x} \]
   \[ = \frac{\sin x}{\cos x} \cdot \frac{1}{\sin x} \]
   \[ = \frac{1}{\cos x} \]
   \[ = \sec x \]
Trigonometric Identities
(It would be a good idea to have these memorized)

Reciprocal Identities:

\[ \csc x = \frac{1}{\sin x} \quad \sec x = \frac{1}{\cos x} \quad \cot x = \frac{1}{\tan x} \]

\[ \sin x = \frac{1}{\csc x} \quad \cos x = \frac{1}{\sec x} \quad \tan x = \frac{1}{\cot x} \]

Quotient Identities:

\[ \cot x = \frac{\cos x}{\sin x} \quad \tan x = \frac{\sin x}{\cos x} \]

Pythagorean Identities:

\[ \sin^2 x + \cos^2 x = 1 \]
\[ \sin^2 x = 1 - \cos^2 x \quad \cos^2 x = 1 - \sin^2 x \]

\[ \sec^2 x - \tan^2 x = 1 \]
\[ \sec^2 x = 1 + \tan^2 x \quad \tan^2 x = \sec^2 x - 1 \]

\[ \csc^2 x - \cot^2 x = 1 \]
\[ \csc^2 x = 1 + \cot^2 x \quad \cot^2 x = \csc^2 x - 1 \]