

Advanced Algebra w/Trig
Trig Identities REVIEW

Name KEY
Date _____ Period _____

Simplify each Expression.

$$\begin{aligned} 1. \cos x(\sec x - \cos x) \\ &= \cos x \sec x - \cos^2 x \\ &= \cos x \cdot \frac{1}{\cos x} - \cos^2 x \\ &= 1 - \cos^2 x \\ &= \boxed{\sin^2 x} \end{aligned}$$

$$\begin{aligned} 3. \frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta} \\ &= \cos^2 \theta + \sin^2 \theta \\ &= \boxed{1} \end{aligned}$$

Verify each Identity.

$$5. \tan^2 x - \sec^2 x = \frac{\sin^2 x - 1}{\cos^2 x} \quad \text{GIVEN}$$

~~$$\frac{\sin^2 x}{\cos^2 x} - \sec^2 x = \frac{\sin^2 x - 1}{\cos^2 x} \quad \text{QUOTIENT IDENTITY}$$~~

$$\frac{\sin^2 x}{\cos^2 x} - \frac{1}{\cos^2 x} = \frac{\sin^2 x - 1}{\cos^2 x} \quad \text{RECIPROCAL IDENTITY}$$

$$\frac{\sin^2 x - 1}{\cos^2 x} = \frac{\sin^2 x - 1}{\cos^2 x} \quad \text{SUBTRACTION}$$

$$7. \frac{1 + \cot x}{1 - \cot x} = \frac{\sin x + \cos x}{\sin x - \cos x} \quad \text{GIVEN}$$

$$\frac{1 + \frac{\cos x}{\sin x}}{1 - \frac{\cos x}{\sin x}} = \frac{\sin x + \cos x}{\sin x - \cos x} \quad \text{RECIPROCAL IDENTITY}$$

$$\frac{\frac{\sin x + \cos x}{\sin x}}{\frac{\sin x - \cos x}{\sin x}} = \frac{\sin x + \cos x}{\sin x - \cos x} \quad \text{CHANGE "1"}$$

$$\frac{\sin x + \cos x}{\sin x} \cdot \frac{\sin x}{\sin x - \cos x} = \frac{\sin x + \cos x}{\sin x - \cos x} \quad \text{DIVIDE FRACTIONS}$$

$$\frac{\sin x + \cos x}{\sin x - \cos x} = \frac{\sin x + \cos x}{\sin x - \cos x} \quad \text{DIVIDE}$$

$$\begin{aligned} 2. \frac{1}{\cot^2 x} - \sec^2 x \\ &= \tan^2 x - \sec^2 x \\ &= \boxed{-1} \end{aligned}$$

$$\begin{aligned} 4. 1 - \frac{\sin \theta}{\csc \theta} \\ &= 1 - \sin \theta \cdot \frac{1}{\csc \theta} \\ &= 1 - \sin \theta \sin \theta \\ &= 1 - \sin^2 \theta \\ &= \boxed{\cos^2 \theta} \end{aligned}$$

$$6. \frac{1}{1 - \cos^2 x} = 1 + \cot^2 x \quad \text{GIVEN}$$

$$\frac{1}{\sin^2 x} = 1 + \cot^2 x \quad \text{PYTHAGOREAN IDENTITY}$$

$$\csc^2 x = 1 + \cot^2 x \quad \text{RECIPROCAL IDENTITY}$$

$$1 + \cot^2 x = 1 + \cot^2 x \quad \text{PYTHAGOREAN IDENTITY}$$

$$8. \frac{\sec x}{\sin x} (1 - \cos^2 x) = \tan x \quad \text{GIVEN}$$

$$\sec x \cdot \frac{1}{\sin x} (1 - \cos^2 x) = \tan x \quad \text{DIVIDE FRACTIONS}$$

$$\frac{1}{\cos x} \cdot \frac{1}{\sin x} (1 - \cos^2 x) = \tan x \quad \text{RECIPROCAL ID.}$$

$$\frac{1}{\cos x} \cdot \frac{1}{\sin x} \cdot \frac{\sin^2 x}{\sin x} = \tan x \quad \text{PYTHAGOREAN ID.}$$

$$\frac{1}{\cos x} = \frac{\sin x}{1} = \tan x \quad \text{MULTIPLY + SIMPLIFY FRACTIONS}$$

$$\frac{\sin x}{\cos x} = \tan x \quad \text{MULTIPLY}$$

$$\tan x = \tan x \quad \text{QUOTIENT IDENTITY}$$

$$9. \cos x(\tan x + \cot x) = \csc x \quad \text{GIVEN}$$

$$\cos x \tan x + \cos x \cot x = \csc x \quad \text{DISTRIBUTE}$$

$$\frac{\cos x}{1} \cdot \frac{\sin x}{\cos x} + \frac{\cos x}{1} \cdot \frac{\cos x}{\sin x} = \csc x \quad \text{QUOTIENT IDENTITY}$$

$$\frac{\sin x}{1} + \frac{\cos^2 x}{\sin x} = \csc x \quad \text{MULTIPLY}$$

$$\frac{\sin^2 x}{\sin x} + \frac{\cos^2 x}{\sin x} = \csc x \quad \text{MULTIPLY BY 1}$$

$$\frac{\sin^2 x + \cos^2 x}{\sin x} = \csc x \quad \text{ADD}$$

$$\frac{1}{\sin x} = \csc x \quad \text{PYTHAGOREAN IDENTITY}$$

$$\csc x = \csc x \quad \text{RECIPROCAL IDENTITY}$$

$$10. \csc^2 x(\sec^2 x - 1) = \frac{1}{\cos^2 x} \quad \text{GIVEN}$$

$$\csc^2 x (\tan^2 x) = \frac{1}{\cos^2 x} \quad \text{PYTHAGOREAN IDENTITY}$$

$$\frac{1}{\sin^2 x} (\tan^2 x) = \frac{1}{\cos^2 x} \quad \text{RECIPROCAL IDENTITY}$$

$$\frac{1}{\sin^2 x} \cdot \frac{\sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} \quad \text{QUOTIENT IDENTITY}$$

$$\frac{1}{\cos^2 x} = \frac{1}{\cos^2 x} \quad \text{DIVIDE}$$

$$11. \frac{\csc x}{\cos x} = \tan x + \cot x \quad \text{GIVEN}$$

$$\frac{\csc^2 x}{\cos x \cdot \csc x} = \tan x + \cot x \quad \text{MULT. BY } \frac{\csc}{\csc}$$

$$\frac{1 + \cot^2 x}{\cos x \cdot \csc x} = \tan x + \cot x \quad \text{PYTHAGOREAN IDENTITY}$$

$$\frac{1}{\cos x \csc x} + \frac{\cot^2 x}{\cos x \csc x} = \tan x + \cot x \quad \text{SPLIT ADDITION}$$

$$\frac{1}{\cos x \frac{1}{\sin x}} + \frac{\cot^2 x}{\cos x \frac{1}{\sin x}} = \tan x + \cot x \quad \text{RECIPROCAL IDENTITY}$$

$$\frac{1}{\cos x} + \frac{\cot^2 x}{\cos x} = \tan x + \cot x \quad \text{MULTIPLICATION}$$

$$\frac{\sin x}{\cos x} + \frac{\cot^2 x \sin x}{\cos x} = \tan x + \cot x \quad \text{DIVISION}$$

$$\tan x + \cot^2 x \tan x = \tan x + \cot x \quad \text{QUOTIENT IDENTITY}$$

$$\tan x + \frac{\tan x}{\tan^2 x} = \tan x + \cot x \quad \text{RECIPROCAL IDENTITY}$$

$$\tan x + \frac{1}{\tan x} = \tan x + \cot x \quad \text{DIVISION}$$

$$\tan x + \cot x = \tan x + \cot x \quad \text{RECIPROCAL IDENTITY}$$

$$12. (\sec x - \tan x)^2 = \frac{1 - \sin x}{1 + \sin x} \quad \text{GIVEN}$$

$$\sec^2 x - 2\sec x \tan x + \tan^2 x = \frac{1 - \sin x}{1 + \sin x} \quad \text{FOIL}$$

$$\frac{1}{\cos^2 x} - 2 \cdot \frac{1}{\cos x} \cdot \tan x + \tan^2 x = \frac{1 - \sin x}{1 + \sin x} \quad \text{RECIPROCAL IDENTITY}$$

$$\frac{1}{\cos^2 x} - 2 \cdot \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x} + \frac{\sin^2 x}{\cos^2 x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{QUOTIENT IDENTITY}$$

$$\frac{1}{\cos^2 x} - \frac{2 \sin x}{\cos^2 x} + \frac{\sin^2 x}{\cos^2 x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{MULTIPLICATION}$$

$$\frac{1 - 2 \sin x + \sin^2 x}{\cos^2 x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{ADD/SUBTRACT}$$

$$\frac{(1 - \sin x)^2}{\cos^2 x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{FACTOR}$$

$$\frac{(1 - \sin x)^2}{1 - \sin^2 x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{PYTHAGOREAN IDENTITY}$$

$$\frac{(1 - \sin x)(1 - \sin x)}{(1 - \sin x)(1 + \sin x)} = \frac{1 - \sin x}{1 + \sin x} \quad \text{FACTOR}$$

$$\frac{1 - \sin x}{1 + \sin x} = \frac{1 - \sin x}{1 + \sin x} \quad \text{DIVIDE/SIMPLIFY}$$