Advanced Algebra w/Trig
Trig Identities Worksheet #1

Name KEY
Date _____ Period _____

Simplify.

1. $\sin\theta(1+\cot^2\theta)$

$= \sin\theta \csc^2\theta$

$= \frac{\sin\theta}{1} \cdot \frac{1}{\sin^2\theta}$

$= \frac{1}{\sin\theta}$

$= \csc\theta$

2. $\frac{1-\sin^2\theta}{\sin^2\theta}$

$= \frac{\cos^2\theta}{\sin^2\theta}$

$= \cot^2\theta$

3. $\frac{\cos\theta\csc\theta}{\tan\theta}$

$= \frac{\cos\theta}{1} \cdot \frac{1}{\sin\theta} \cdot \frac{1}{\tan\theta}$

$= \frac{\cos\theta}{1} \cdot \frac{1}{\sin\theta} \cdot \cot\theta$

$= \frac{\cos\theta}{1} \cdot \frac{1}{\sin\theta} \cdot \frac{\cos\theta}{\sin\theta}$

$= \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta$

4. $\csc^2\alpha - \cot^2\alpha = +1$

5. $\tan\theta\csc\theta$

$= \frac{\sin\theta}{\cos\theta} \cdot \frac{1}{\sin\theta}$

$= \frac{1}{\cos\theta}$

$= \sec\theta$

6. $\frac{1}{\sin^2\theta} - \frac{\cos^2\theta}{\sin^2\theta}$

$= \frac{1-\cos^2\theta}{\sin^2\theta}$

$= \frac{\sin^2\theta}{\sin^2\theta}$

$= 1$

Verify each identity.

7. $\dfrac{\sin x}{\csc x}+\dfrac{\cos x}{\sec x}=1$

GIVEN

$\sin x \cdot \frac{1}{\csc x} + \cos x \cdot \frac{1}{\sec x} = 1$ — DIVISION

$\sin x \cdot \sin x + \cos x \cdot \frac{1}{\sec x} = 1$ — RECIPROCAL IDENTITY

$\sin x \cdot \sin x + \cos x \cdot \cos x = 1$ — RECIPROCAL IDENTITY

$\sin^2 x + \cos^2 x = 1$ — MULTIPLICATION

$1 = 1$ ■ — PYTHAGOREAN IDENTITY

8. $\dfrac{\sin x \csc x}{\cot x}=\tan x$

GIVEN

$\sin x \cdot \csc x \cdot \frac{1}{\cot x} = \tan x$ — DIVISION

$\sin x \cdot \frac{1}{\sin x} \cdot \frac{1}{\cot x} = \tan x$ — RECIPROCAL IDENTITY

$1 \cdot \frac{1}{\cot x} = \tan x$ — MULTIPLICATION

$\tan x = \tan x$ ■ — RECIPROCAL IDENTITY

Challenge Problem

9. $\dfrac{1-\tan^2 x}{\cot^2 x-1}=\tan^2 x$

GIVEN

$\dfrac{1-\frac{\sin^2 x}{\cos^2 x}}{\cot^2 x - 1} = \tan^2 x$ — QUOTIENT IDENTITY

$\dfrac{1-\frac{\sin^2 x}{\cos^2 x}}{\frac{\cos^2 x}{\sin^2 x} - 1} = \tan^2 x$ — QUOTIENT IDENTITY

$\dfrac{\frac{\cos^2 x}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x}}{\frac{\cos^2 x}{\sin^2 x} - 1} = \tan^2 x$ — REWRITE "1"

$\dfrac{\frac{\cos^2 x}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x}}{\frac{\cos^2 x}{\sin^2 x} - \frac{\sin^2 x}{\sin^2 x}} = \tan^2 x$ — REWRITE "1"

$\dfrac{\frac{\cos^2 x - \sin^2 x}{\cos^2 x}}{\frac{\cos^2 x - \sin^2 x}{\sin^2 x}} = \tan^2 x$ — SUBTRACTION OF FRACTIONS

$\dfrac{\cos^2 x - \sin^2 x}{\cos^2 x} \cdot \dfrac{\sin^2 x}{\cos^2 x - \sin^2 x} = \tan^2 x$ — DIVISION

$\dfrac{\sin^2 x}{\cos^2 x} = \tan^2 x$ — DIVISION

$\tan^2 x = \tan^2 x$ ■ — QUOTIENT IDENTITY.