GSE PreCalculus Unit 5: Trig Identities
Worksheet 5.5

Name Key
Date _____ Day ____

Even/Odd Identities - Verify

1. $\csc(-x)\tan(-x) = \sec x$

$-\csc(x) - \tan x$

$\left(-\frac{1}{\sin x}\right)\left(-\frac{\sin x}{\cos x}\right)$

$\frac{1}{\cos x} = \sec x = \sec x$ ✓

2. $\cos(-\theta)\sec\theta - \cos^2\theta = \sin^2\theta$

$\cos\theta \sec\theta - \cos^2\theta$

$\cos\theta\left(\frac{1}{\cos\theta}\right) - \cos^2\theta$

$1 - \cos^2\theta =$

$\sin^2\theta = \sin^2\theta$ ✓

3. $\frac{\csc(-x)}{\sin(-x)} + \frac{\cot(-x)}{\tan x} = 1$

$\frac{-\csc(x)}{-\sin x} + \frac{-\cot x}{\tan x}$

$-\frac{1}{\sin x}\cdot\frac{-1}{\sin x} + \frac{-\frac{\cos x}{\sin x}}{\frac{\sin x}{\cos x}}\cdot\frac{\cos x}{\sin x}$

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

$\frac{\sin^2 x}{\sin^2 x} = 1 = 1$ ✓

4. $\frac{\csc(-x)}{\sec(-x)} = \cot(-x)$

$\frac{-\csc x}{\sec x}$ $\quad -\frac{\frac{1}{\sin x}}{\frac{1}{\cos x}}\cdot\frac{\cos x}{1}$

$-\frac{\cos x}{\sin x}$

$= -\cot x = \cot(-x)$ ✓

Verify each identity.

1. $\sin\theta \csc\theta = 1$

$\sin\theta\left(\frac{1}{\sin\theta}\right)$

$\frac{\sin\theta}{\sin\theta}$

$1 = 1$ ✓

2. $\sec x \cos x = 1$

$\frac{1}{\cos x}\cdot\frac{\cos x}{1}$

$\frac{\cos x}{\cos x}$

$1 = 1$

3. $\cos^2\theta - \sin^2\theta = 1 - 2\sin^2\theta$

$(1 - \sin^2\theta) - \sin^2\theta$

$1 - \sin^2\theta - \sin^2\theta$

$1 - 2\sin^2\theta = 1 - 2\sin^2\theta$ ✓

4. $\tan^2\beta + 4 = \sec^2\beta + 3$

$\sec^2\beta - 1 + 4$

$\sec^2\beta + 3 = \sec^2\beta + 3$

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5. $\dfrac{\cot^2\alpha}{\csc\alpha} = \csc\alpha - \sin\alpha$

$\dfrac{\csc^2\alpha - 1}{\csc\alpha}$ $\quad \csc\alpha - \dfrac{1}{\csc\alpha}$ $\quad 1 \cdot \dfrac{\sin\alpha}{1}$

$\dfrac{\csc^2\alpha}{\csc\alpha} - \dfrac{1}{\csc\alpha}$ $\quad \csc\alpha - \dfrac{1}{\frac{1}{\sin\alpha}}$ $\quad \csc\alpha - \sin\alpha = \csc\alpha - \sin\alpha$

6. $\dfrac{1}{\tan\beta} + \tan\beta = \dfrac{\sec^2\beta}{\tan\beta}$

$\dfrac{1}{\tan\beta} + \dfrac{\tan\beta}{1} \cdot \dfrac{\tan\beta}{\tan\beta}$

$\dfrac{1+\tan^2\beta}{\tan\beta} = \dfrac{\sec^2\beta}{\tan^2\beta}$ ✓

7. $\cot\alpha + \tan\alpha = \csc\alpha \sec\alpha$

$\dfrac{\cos\alpha}{\cos\alpha} \cdot \dfrac{\cos\alpha}{\sin\alpha} + \dfrac{\sin\alpha}{\cos\alpha} \cdot \dfrac{\sin\alpha}{\sin\alpha}$

$\dfrac{\cos^2\alpha + \sin^2\alpha}{\sin\alpha\cos\alpha}$

$\dfrac{1}{\sin\alpha\cos\alpha}$

$\dfrac{1}{\sin\alpha} \cdot \dfrac{1}{\cos\alpha} = \csc\alpha\sec\alpha = \csc\alpha\sec\alpha$ ✓

8. $\sec x - \cos x = \sin x \tan x$

$\dfrac{1}{\cos x} - \dfrac{\cos x \cdot \cos x}{1 \cdot \cos x}$

$\dfrac{1-\cos^2 x}{\cos x}$

$\dfrac{\sin^2 x}{\cos x} = \sin x \cdot \dfrac{\sin x}{\cos x} = \sin x \cdot \tan x$ ✓

9. $\dfrac{\sin^3 x - 5\sin^2 x + 6\sin x}{\sin x - 2} = \sin^2 x - 3\sin x$

Hint: Factor numerator using GCF first

$\dfrac{\sin x\,(\sin^2 x - 5\sin x + 6)}{\sin x - 2}$

$\dfrac{\sin x\,(\sin x - 3)(\sin x - 2)}{\sin x - 2}$

$\sin x\,(\sin x - 3)$

$\sin^2 x - 3\sin x$ ✓

10. $\dfrac{\csc(-x)}{\sec(-x)} = -\cot x$

Hint: use even/odd identities on left side

$\dfrac{-\csc x}{\sec x}$

$\dfrac{-\frac{1}{\sin x}}{\frac{1}{\cos x}}$

$-\dfrac{1}{\sin x} \cdot \dfrac{\cos x}{1}$

$-\dfrac{\cos x}{\sin x}$

$-\cot x = -\cot x$ ✓