Pre-Calculus A
Section 5.1 Factoring GCF and LCD HW

Name : Key
Date : _____ Period : ___

Simplify the following trigonometric expressions.

1. $\sin^2 x\cos^2 x-\cos^2 x$

$\cos^2x\,(\sin^2x-1)$ ← Pythag Identity

$\cos^2x\,(-\cos^2x)$

$\boxed{-\cos^4x}$

2. $\sec^2 x\cot x-\cot x$

$\cot x(\sec^2x-1)$ ← Pythag. identity

$\cot x\,(\tan^2x)$

$\frac{\cos x}{\sin x}\left(\frac{\sin^2x}{\cos^2x}\right)$

$\frac{\cancel{\cos x}}{\cancel{\sin x}}\left(\frac{\cancel{\sin x}\cdot\sin x}{\cancel{\cos x}\cdot\cos x}\right)$

$\frac{\sin x}{\cos x}=\boxed{\tan x}$

3. $\sin^3 x+\sin x\cos^2 x$

$\sin x\,(\sin^2x+\cos^2x)$ ← Pythag. identity

$\sin x\,(1)$

$=\boxed{\sin x}$

4. $\cot^2 x-\cot^2 x\cos^2 x$

$\cot^2x\,(1-\cos^2x)$ ← Pythag. identity

$\cot^2x\,(\sin^2x)$

$\frac{\cos^2x}{\cancel{\sin^2x}}\left(\frac{\cancel{\sin^2x}}{1}\right)$

$=\boxed{\cos^2x}$

5. $\sin x\csc x-\sin^2 x$

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

$\frac{\sin x}{1}\left(\frac{1}{\sin x}-\frac{\sin x}{1}\right)$ ← LCD: $\sin x$

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

$\frac{\sin x}{1}\left(\frac{1}{\sin x}-\frac{\sin^2x}{\sin x}\right)$

$\frac{\sin x}{1}\left(\frac{1-\sin^2x}{\sin x}\right)$ ← Pythag. identity

$\frac{\cancel{\sin x}}{1}\left(\frac{\cos^2x}{\cancel{\sin x}}\right)$

$=\boxed{\cos^2x}$

6. $\csc x-\cos x\cot x$

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

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

$\frac{1-\cos^2x}{\sin x}$ ← Pythag identity

$\frac{\sin^2x}{\sin x}$

$\frac{\cancel{\sin x}\cdot\sin x}{\cancel{\sin x}}$

$=\boxed{\sin x}$

7. $\cos x + \sin x \tan x$

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

$\frac{\cos x}{\cos x} \cdot \frac{\cos x}{1} + \frac{\sin^2 x}{\cos x}$ ← LCD: $\cos x$

$\frac{\cos^2 x}{\cos x} + \frac{\sin^2 x}{\cos x}$

$\frac{\cos^2 x + \sin^2 x}{\cos x}$ ← Pythag Identity

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

8. $\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x}$ ← LCD: $(\sin x)(\cos x)$

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

$\frac{\cos^2 x}{(\cos x)(\sin x)} + \frac{\sin^2 x}{(\cos x)(\sin x)}$

$\frac{\cos^2 x + \sin^2 x}{(\cos x)(\sin x)}$

$\frac{1}{(\cos x)(\sin x)} = \boxed{\sec x \csc x}$

9. $\tan x - \frac{\sec^2 x}{\tan x}$

$\frac{\sin x}{\cos x} - \frac{1}{\cos x \sin x}$ ← LCD: $\cos x \sin x$

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

$\frac{\sin^2 x - 1}{\sin x \cos x}$ ← Pythag Identity

$-\frac{\cos^2 x}{\sin x \cos x} = -\frac{\cos x}{\sin x} = \boxed{-\cot x}$

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

10. $\frac{\cos x}{1+\sin x} + \frac{1+\sin x}{\cos x}$ ← LCD: $(\cos x)(1+\sin x)$

$\frac{\cos x}{\cos x} \cdot \frac{\cos x}{(1+\sin x)} + \frac{1+\sin x}{\cos x} \cdot \frac{(1+\sin x)}{(1+\sin x)}$

$\frac{\cos^2 x}{\cos x(1+\sin x)} + \frac{1+2\sin x+\sin^2 x}{\cos x(1+\sin x)}$

Pythag Identity → $\frac{\cos^2 x + \sin^2 x + 1 + 2\sin x}{\cos x(1+\sin x)}$

$\frac{1+1+2\sin x}{\cos x(1+\sin x)}$

$\frac{2+2\sin x}{\cos x(1+\sin x)}$

$\frac{2(1+\sin x)}{\cos x(1+\sin x)}$

$= \frac{2}{\cos x}$

$= \boxed{2\sec x}$

11. $\frac{\tan\theta + \cot\theta}{\cot\theta}$

$\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}$ ← LCD: $(\cos\theta)(\sin\theta)$

$\frac{\sin\theta}{\sin\theta} \cdot \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} \cdot \frac{\cos\theta}{\cos\theta}$

$\frac{\sin^2\theta + \cos^2\theta}{(\sin\theta)(\cos\theta)}$

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

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

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

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

$= \boxed{\sec^2\theta}$

12. $(1-\cos x)(1+\sec x)(\cos x)$ ← FOIL

$(1 + \sec x - \cos x - \cos x \sec x)(\cos x)$

$(1 + \sec x - \cos x - \frac{\cos x}{1} \cdot \frac{1}{\cos x})(\cos x)$

$(1 + \sec x - \cos x - 1)(\cos x)$

$(\sec x - \cos x)(\cos x)$

$\cos x \sec x - \cos^2 x$

$\frac{\cos x}{1} \cdot \frac{1}{\cos x} - \cos^2 x$

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

Answer Key: 1) $-\cos^4 x$ ✓ 2) $\tan x$ ✓ 3) $\sin x$ ✓ 4) $\cos^2 x$ ✓ 5) $\cos^2 x$ ✓ 6) $\sin x$ ✓ 7) $\sec x$ ✓ 8) $\csc x \sec x$ ✓ 9) $-\cot x$ ✓ 10) $2\sec x$ ✓ 11) $\sec^2\theta$ ✓ 12) $\sin^2 x$ ✓