Name KEY Date________________ Period______________

Precal Matters: Practice TEST: 6.1-6.4: NO CALCULATOR. Show ALL steps

Part I: Trig Proofs with Fundamental Identities

Prove 5 out of 6 Identities. Show all steps including substitutions and algebraic procedures.

1. $(\sin A + \cos A)^2 = 1 + 2\cos A \sin A$

$\sin^2 A + 2\sin A\cos A + \cos^2 A$

$1 + 2\sin A\cos A$

$1 + 2\cos A\sin A$

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2. $\sec x(\sec x + 1) = \dfrac{\tan^2 x}{1 - \cos x}\left(\dfrac{1+\cos x}{1+\cos x}\right)$

$\dfrac{\tan^2 x(1+\cos x)}{1-\cos^2 x}$

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

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

$\sec^2 x(1+\cos x)$

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

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

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

$\sin x\cdot\sin x + \cos x\cos x$

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

1

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4. $\dfrac{\sec^2 x - 7\tan x + 11}{\sec^2 x - 17} = \dfrac{\tan x - 3}{\tan x + 4}$

$\dfrac{1+\tan^2 x - 7\tan x + 11}{1+\tan^2 x - 17}$

$\dfrac{\tan^2 x - 7\tan x + 12}{\tan^2 x - 16}$

$\dfrac{\cancel{(\tan x - 4)}(\tan x - 3)}{\cancel{(\tan x - 4)}(\tan x + 4)}$

$\dfrac{\tan x - 3}{\tan x + 4}$

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5. $\dfrac{1-\cos B}{\sin B} = \dfrac{\sin B}{1+\cos B}\left(\dfrac{1-\cos B}{1-\cos B}\right)$

$\dfrac{\sin B(1-\cos B)}{1-\cos^2 B}$

$\dfrac{\sin B(1-\cos B)}{\sin^2 B}$

$\dfrac{1-\cos B}{\sin B}$

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6. $\dfrac{\sin A}{1+\sec A} = \dfrac{\sin A\cos A}{\cos A + 1}$

$\left(\dfrac{\cos A}{\cos A}\right)\dfrac{\sin A}{1+\frac{1}{\cos A}}$

$\dfrac{\sin A\cos A}{\cos A + 1}$

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Part II: Solving Trigonometric Equations

For each of the following, solve each trig function without a calculator, where $0 \le x < 2\pi$. Show all work and give simplified, exact answers.

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

$\sin 2x + 2\cos x = 0$

$2\sin x\cos x + 2\cos x = 0$

$2\cos x(\sin x + 1) = 0$

$\cos x = 0$ or $\sin x = -1$

$x = \frac{\pi}{2}, \frac{3\pi}{2}$ $\quad x = \frac{3\pi}{2}$

So, $x = \frac{\pi}{2}, \frac{3\pi}{2}$

2. $2 - 2\cos^2 x - 5\sin x = -2$

$-2(\cos^2 x) - 5\sin x + 4 = 0$

$-2(1-\sin^2 x) - 5\sin x + 4 = 0$

$-2 + 2\sin^2 x - 5\sin x + 4 = 0$

$2\sin^2 x - 5\sin x + 2 = 0$

$(2\sin x - 1)(\sin x - 2) = 0$

$\sin x = \frac{1}{2}$ $\quad \sin x = 2$ No solution

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

So, $x = \frac{\pi}{6}, \frac{5\pi}{6}$

3. $5\sqrt{3}\tan x + 3 = 8\sqrt{3}\tan x$

$5\sqrt{3}\tan x - 8\sqrt{3}\tan x = -3$

$-3\sqrt{3}\tan x = -3$

$\tan x = \frac{-3}{-3\sqrt{3}}$

$\tan x = \frac{1}{\sqrt{3}}\left(\frac{1/2}{1/2}\right)$

$\tan x = \frac{1/2}{\sqrt{3}/2} = \frac{-1/2}{-\sqrt{3}/2}$

So, $x = \frac{\pi}{6}, \frac{7\pi}{6}$

Part III: Trig Proofs with any Identities

Prove 5 out of 6 Identities. Show all steps including substitutions and algebraic procedures.

1. $\sqrt{2}\cos(x - \frac{\pi}{4}) = \cos x + \sin x$

$\sqrt{2}\left[\cos x\cos\frac{\pi}{4} + \sin x\sin\frac{\pi}{4}\right]$

$\sqrt{2}\left[\cos x \cdot \frac{\sqrt{2}}{2} + \sin x \cdot \frac{\sqrt{2}}{2}\right]$

$\cos x + \sin x$

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2. $\tan A = \dfrac{1 - \cos 2A}{\sin 2A}$

$\dfrac{1 - [\cos^2 A - \sin^2 A]}{2\sin A\cos A}$

$\dfrac{1 - \cos^2 A + \sin^2 A}{2\sin A\cos A}$

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

$\dfrac{2\sin^2 A}{2\sin A\cos A}$

$\dfrac{\sin A}{\cos A}$

$\tan A$

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3. $\tan^2\dfrac{B}{2} = \csc^2 B - 2\cot B\csc B + \cot^2 B$

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$\dfrac{1-\cos B}{1+\cos B}$

$(\csc B - \cot B)^2$

$\left(\dfrac{1}{\sin B} - \dfrac{\cos B}{\sin B}\right)^2$

$\left(\dfrac{1-\cos B}{\sin B}\right)^2$

$\dfrac{(1-\cos B)^2}{\sin^2 B}$

$\dfrac{(1-\cos B)^2}{1-\cos^2 B}$

$\dfrac{\cancel{(1-\cos B)}(1-\cos B)}{\cancel{(1-\cos B)}(1+\cos B)}$

$\dfrac{1-\cos B}{1+\cos B}$

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4. $\tan\left(\dfrac{5\pi}{4} - \theta\right) = \dfrac{1 - \tan\theta}{1 + \tan\theta}$

$\dfrac{\tan\frac{5\pi}{4} - \tan\theta}{1 + \tan\frac{5\pi}{4}\cdot\tan\theta}$

$\dfrac{1 - \tan\theta}{1 + \tan\theta}$

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5. $\cos 3x = \cos^3 x - 3\sin^2 x\cos x$

$\cos(x + 2x)$

$\cos x\cos 2x - \sin x\sin 2x$

$\cos x(\cos^2 x - \sin^2 x) - \sin x \cdot 2\sin x\cos x$

$\cos^3 x - \cos x\sin^2 x - 2\sin^2 x\cos x$

$\cos^3 x - 3\sin^2 x\cos x$

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6. $\cos 2\theta = \dfrac{1 - \tan^2\theta}{1 + \tan^2\theta}$

$\cos^2\theta - \sin^2\theta$

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

$\dfrac{\cos^2\theta - \sin^2\theta}{\cos^2\theta + \sin^2\theta}$

$\dfrac{\cos^2\theta - \sin^2\theta}{1}$

$\cos^2\theta - \sin^2\theta$

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