Name_____ Date_____ Period_____

Worksheet 6.1—Fundamental Identities

Show all work. No Calculator permitted (unless stated otherwise).

I. Multiple Choice

1. Which of the following does NOT equal $\sin x$?

(A) $\cos\left(\frac{\pi}{2}-x\right)$ (B) $\cos\left(x-\frac{\pi}{2}\right)$ (C) $\sqrt{1-\cos^2 x}$ (D) $\tan x \sec x$ (E) $-\sin(-x)$

2. Exactly four of the six basic trig functions are

(A) odd (B) even (C) periodic (D) continuous (E) bounded

3. Exactly two of the six basic trig functions are

(A) one-to-one (B) odd (C) monotonic (D) discontinuous (E) unbounded

4. A simpler expression for $(\sec y+1)(\sec y-1)$ is

(A) $\sin^2 y$ (B) $\cos^2 y$ (C) $\tan^2 y$ (D) $\cot^2 y$ (E) $\sec^2 y$

5. How many solutions between 0 and 2π does the equation $3\cos^2 x + \cos x = 2$ have?
(A) none (B) one (C) two (D) three (E) four

II. Short Answer

6. Use identities to evaluate the expressions.
(a) if $\sin\theta = 0.45$, find $\cos\left(\frac{\pi}{2} - \theta\right)$. (b) if $\cot(-\theta) = 7.89$, find $\tan\left(\theta - \frac{\pi}{2}\right)$

7. Use fundamental identities to simplify the following expressions:
(a) $\tan x \cos x$ (b) $\sec\beta \sin\left(\frac{\pi}{2} - \beta\right)$ (c) $\frac{1-\cos^2 \mathrm{K}}{\sin \mathrm{K}}$ (d) $\frac{\sin^2 u + \tan^2 u + \cos^2 u}{\sec u}$

8. Simplify the expressions to either 1 or -1.

(a) $-\sec(-x)\cos(-x)$ (b) $\cot(-\Omega)\cot\left(\Omega-\frac{\pi}{2}\right)$ (c) $\sin^2(-\alpha)+\cos^2(-\alpha)$

9. Simplify to a constant or a basic trig function.

(a) $\dfrac{\tan\left(\frac{\pi}{2}-x\right)\csc x}{1+\cot^2 x}$ (b) $\dfrac{1+\tan\mu}{1+\cot\mu}$ (c) $\left(\sec^2\phi+\csc^2\phi\right)-\left(\tan^2\phi+\cot^2\phi\right)$

10. Use fundamental identities to change the expression to one involoving only sines and cosines, then simplify to a basic trig function.

(a) $\sin x\left(\tan x+\cot x\right)$ (b) $\dfrac{\left(\sec\Psi-\tan\Psi\right)\left(\sec\Psi+\tan\Psi\right)}{\sec\Psi}$ (c) $\dfrac{\sec^2 \mathrm{A}\csc \mathrm{A}}{\sec^2 \mathrm{A}+\csc^2 \mathrm{A}}$

11. Combine the fractions, then simplify to a power of a basic trig function.

(a) $\dfrac{1}{\sin^2 x}+\dfrac{\sec^2 x}{\tan^2 x}$ (b) $\dfrac{1}{\sec x-1}-\dfrac{1}{\sec x+1}$ (c) $\dfrac{\sin x}{1-\cos x}+\dfrac{1-\cos x}{\sin x}$

12. Simplify by factoring.

(a) $1-2\sin x+\left(1-\cos^2 x\right)$ (b) $4\tan^2 x-\dfrac{4}{\cot x}+\sin x\csc x$ (c) $\sec^2 x-\sec x+\tan^2 x$

13. Simplify by factoring and dividing out.

(a) $\dfrac{1-\sin^2 x}{1-\sin x}$ (b) $\dfrac{1-\tan^2 \beta}{\tan \beta+1}$ (c) $\dfrac{\tan^2 \alpha}{\sec \alpha+1}$

14. Simplify using any method.

(a) $\cos^3 x + \sin^2 x \cos x$ (b) $\tan A \cos A \csc A$ (c) $\dfrac{\cos\theta}{\sec\theta + \tan\theta}$ (d) $\dfrac{\tan^2 x + 2}{\sec^2 x} - 1$

15. Verify the following identites by using angles from the Unit Circle.

(a) $\dfrac{\tan y}{\csc y} = \sec y - \cos y$ (b) $\cot(-x)\cos(-x) + \sin(-x) = -\csc x$ (c) $\dfrac{1+\sec^2 x}{1+\tan^2 x} = 1 + \cos^2 x$

16. Find all solutions to the equations in the interval $[0, 2\pi)$. Give exact radian answers. No calculator.

(a) $2\cos x \sin x = \cos x$ (b) $\sqrt{2}\tan x \cos x = \tan x$ (c) $2\tan^2 x = 6$

17. Find **all** solutions (give a formula that generates them) to the equations. Give exact radian answers. No calculator.

(a) $4\cos^2 x - 4\cos x = -1$ (b) $3\sin t = 2\cos^2 t$ (c) $\cos(\sin x) = 1$

18. (Calculator permitted) Find **all** solutions (give a formula that generates them) to the equations. Use a calculator, and give 3-decimal approximations.

(a) $\cos x = 1.77$ (b) $\cot x = 0.2$ (c) $\sin^2 x = 0.9$