Name: ____ Date: ____________________________

Section 6.3 Extra Practice

1. Rewrite each expression in terms of sine and cosine only. Then simplify.

a) $\dfrac{\sec x}{\tan x}$

b) $\dfrac{\cot^2 x}{1 - \sin^2 x}$

c) $\dfrac{\csc x - \sin x}{\cot x}$

2. Factor and simplify each rational trigonometric expression.

a) $\dfrac{\tan x - \tan x \sin^2 x}{\cos^2 x}$

b) $\dfrac{\sin^2 x + \sin x - 6}{5\sin x + 15}$

c) $\dfrac{\cos^2 x - 4}{7\cos x - 14}$

d) $\dfrac{\sin^2 x \tan x - \tan x}{\sin x \tan x + \tan x}$

3. Use the Pythagorean identities to prove each identity for all permissible values of x.

a) $\csc^2 x(1 - \cos^2 x) = 1$

b) $(\tan x - 1)^2 = \sec^2 x - 2 \tan x$

c) $\dfrac{\sin^2 x + \cos^2 x}{\sec x} = \cos x$

4. Prove each identity. Use a common denominator to express two terms as one term, when necessary.

a) $\dfrac{1 + \tan x}{1 + \cot x} = \tan x$

b) $\dfrac{\sec x}{\sin x} - \dfrac{\sin x}{\cos x} = \cot x$

c) $\dfrac{\cot x + \tan x}{\sec x} = \csc x$

5. Prove each identity, using factoring.

a) $\dfrac{\csc x + \cot x}{\tan x + \sin x} = \cot x \csc x$

b) $\dfrac{\sin x + \tan x}{\cos x + 1} = \tan x$

c) $\dfrac{\cos x + 1}{\sin x + \tan x} = \cot x$

6. Verify each potential identity, then prove each identity.

a) $\dfrac{\cos x}{1 - \sin x} = \dfrac{1 + \sin x}{\cos x}$

b) $\dfrac{1 + \cos x}{\sin x} = \dfrac{\sin x}{1 - \cos x}$

c) $\dfrac{\cos x}{\sec x - 1} + \dfrac{\cos x}{\sec x + 1} = 2\cot^2 x$

7. Prove the following algebraically.

a) $\cos(x + y)\cos(x - y) = \cos^2 x - \sin^2 y$

b) $\dfrac{1 + \cos 2x}{\sin 2x} = \cot x$

c) $1 + \sin 2x = (\sin x + \cos x)^2$

d) $\sec^2 x = \dfrac{2}{1 + \cos 2x}$

8. Verify each equation is true for $x = 30°$. Then prove each equation is an identity.

a) $\sec^4 x - \sec^2 x = \tan^4 x + \tan^2 x$

b) $\cos x + \cos x \tan^2 x = \sec x$

9. Consider the equation
$$\frac{\cos^2 x}{1 + 2\sin x - 3\sin^2 x} = \frac{1 + \sin x}{1 + 3\sin x}.$$

a) Show that the equation is true for $x = 3.2$ radians.

b) Use a graph to show that the equation may be an identity.

10. a) Prove that $\tan\theta = \dfrac{1 - \cos 2\theta}{\sin 2\theta}$.

b) State any non-permissible values.

11. Prove the following identity.
$1 + \sin 2x = (\sin x + \cos x)^2$

12. Prove the following identity.
$\cos 3x + 1 = 4\cos^3 x - 3\cos x + 1$

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Section 6.4 Extra Practice

1. Solve each equation algebraically over the domain $0 \le x < 2\pi$.

a) $\sin 2x - \cos x = 0$
b) $\cos 2x = 0$
c) $2\cos^2 x - 1 = 0$
d) $\cos^2 x - 2 = \cos x$

2. Solve each equation algebraically over the domain $0° \le x < 360°$.

a) $\cos 2x = \cos 3x$
b) $2 \cos^2 x - 5 \sin x - 5 = 0$
c) $\cot^2 x = 0$

3. Rewrite each equation in terms of cosine only. Then, solve algebraically for $0 \le x < 2\pi$.

a) $\cos 2x - 5 \cos x = 2$
b) $\cot^2 x + 2 = 0$
c) $1 + \cos x = 2 \sin^2 x$

4. Solve $2 \cos^2 x = 1$ algebraically over the domain $-180° \le x \le 180°$.

5. Solve $\tan^2 x + 2 \tan x + 1 = 0$ algebraically over the domain $0 \le x < 2\pi$.

6. Determine the mistake the student made in the following work. Then, complete a correct solution.

$\sin 2x = 1$

$\sin x = \frac{1}{2}$

$x = 60°$ and $120°$

7. A student is asked to write the equation of the general solution of the following equation: $\sin 2x = 1$

The solutions for this equation in the domain $0 \le x < 2\pi$ are $\frac{\pi}{4}, \frac{5\pi}{4}$.

The student writes the general solution as $\frac{\pi}{4} + 2\pi n, \frac{5\pi}{4} + 2\pi n; n \in I$.

a) What error did the student make?
b) Write the correct general solution for this equation.

8. a) Explain how to solve the equation $\cos x - 2 \sin x \cos x = 0$ graphically, using the intersection feature of the graphing calculator.
b) Solve the equation from part a) algebraically over the domain $0 \le x < 2\pi$.

9. Solve $(\sin x - 1)(\tan x - 1) = 0$ algebraically for all values of x.

10. Solve the following equation for x. Give the general solution in degrees.

$2 \cos 2x + 1 = 0$