

## Section 6.3 Extra Practice

- Rewrite each expression in terms of sine and cosine only. Then simplify.
  - $\frac{\sec x}{\tan x}$
  - $\frac{\cot^2 x}{1 - \sin^2 x}$
  - $\frac{\csc x - \sin x}{\cot x}$
- Factor and simplify each rational trigonometric expression.
  - $\frac{\tan x - \tan x \sin^2 x}{\cos^2 x}$
  - $\frac{\sin^2 x + \sin x - 6}{5 \sin x + 15}$
  - $\frac{\cos^2 x - 4}{7 \cos x - 14}$
  - $\frac{\sin^2 x \tan x - \tan x}{\sin x \tan x + \tan x}$
- Use the Pythagorean identities to prove each identity for all permissible values of  $x$ .
  - $\csc^2 x (1 - \cos^2 x) = 1$
  - $(\tan x - 1)^2 = \sec^2 x - 2 \tan x$
  - $\frac{\sin^2 x + \cos^2 x}{\sec x} = \cos x$
- Prove each identity. Use a common denominator to express two terms as one term, when necessary.
  - $\frac{1 + \tan x}{1 + \cot x} = \tan x$
  - $\frac{\sec x}{\sin x} - \frac{\sin x}{\cos x} = \cot x$
  - $\frac{\cot x + \tan x}{\sec x} = \csc x$
- Prove each identity, using factoring.
  - $\frac{\csc x + \cot x}{\tan x + \sin x} = \cot x \csc x$
  - $\frac{\sin x + \tan x}{\cos x + 1} = \tan x$
  - $\frac{\cos x + 1}{\sin x + \tan x} = \cot x$
- Verify each potential identity, then prove each identity.
  - $\frac{\cos x}{1 - \sin x} = \frac{1 + \sin x}{\cos x}$
  - $\frac{1 + \cos x}{\sin x} = \frac{\sin x}{1 - \cos x}$
  - $\frac{\cos x}{\sec x - 1} + \frac{\cos x}{\sec x + 1} = 2 \cot^2 x$
- Prove the following algebraically.
  - $\cos(x + y) \cos(x - y) = \cos^2 x - \sin^2 y$
  - $\frac{1 + \cos 2x}{\sin 2x} = \cot x$
  - $1 + \sin 2x = (\sin x + \cos x)^2$
  - $\sec^2 x = \frac{2}{1 + \cos 2x}$
- Verify each equation is true for  $x = 30^\circ$ . Then prove each equation is an identity.
  - $\sec^4 x - \sec^2 x = \tan^4 x + \tan^2 x$
  - $\cos x + \cos x \tan^2 x = \sec x$
- Consider the equation
 
$$\frac{\cos^2 x}{1 + 2 \sin x - 3 \sin^2 x} = \frac{1 + \sin x}{1 + 3 \sin x}.$$
  - Show that the equation is true for  $x = 3.2$  radians.
  - Use a graph to show that the equation may be an identity.
- Prove that  $\tan \theta = \frac{1 - \cos 2\theta}{\sin 2\theta}$ .
  - State any non-permissible values.
- Prove the following identity.
 
$$1 + \sin 2x = (\sin x + \cos x)^2$$
- Prove the following identity.
 
$$\cos 3x + 1 = 4 \cos^3 x - 3 \cos x + 1$$

