14-3 Exercises

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GUIDED PRACTICE

SEE EXAMPLE 1 p. 1008

Prove each trigonometric identity.

1. $\sin\theta\sec\theta = \tan\theta$
2. $\cot(-\theta) = -\cot\theta$
3. $\cos^2\theta\left(\sec^2\theta - 1\right) = \sin^2\theta$

SEE EXAMPLE 2 p. 1009

Rewrite each expression in terms of $\cos\theta$, and simplify.

4. $\csc\theta\tan\theta$
5. $\left(1 + \sec^2\theta\right)\left(1 - \sin^2\theta\right)$
6. $\sin^2\theta + \cos^2\theta + \tan^2\theta$

SEE EXAMPLE 3 p. 1010

7. **Physics** Use the equation $mg\sin\theta = \mu mg\cos\theta$ to determine the angle at which a glass-top table can be tilted before a glass plate on the table begins to slide. Assume $\mu = 0.94$.

PRACTICE AND PROBLEM SOLVING

Independent Practice

For Exercises	See Example
8–11	1
12–15	2
16	3

Extra Practice

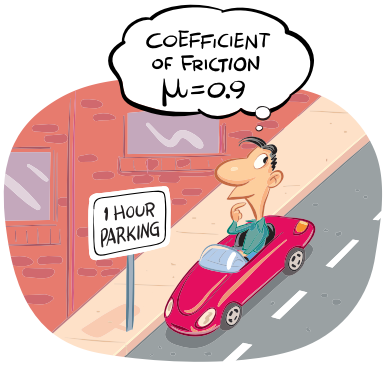
Skills Practice p. S31
Application Practice p. S45

Prove each trigonometric identity.

8. $\sec\theta\cot\theta = \csc\theta$
9. $\dfrac{\sin\theta - \cos\theta}{\sin\theta} = 1 - \cot\theta$
10. $\tan\theta\sin\theta = \sec\theta - \cos\theta$
11. $\sec^2\theta\left(1 - \cos^2\theta\right) = \tan^2\theta$

Rewrite each expression in terms of $\sin\theta$, and simplify.

12. $\dfrac{\cos^2\theta}{1 + \sin\theta}$
13. $\dfrac{\tan\theta}{\cot\theta}$
14. $\cos\theta\cot\theta + \sin\theta$
15. $\dfrac{\sec^2\theta - 1}{1 + \tan^2\theta}$



16. **Physics** Use the equation $mg\sin\theta = \mu mg\cos\theta$ to determine the steepest slope of the street shown on which a car with rubber tires can park without sliding.

Multi-Step **Rewrite each expression in terms of a single trigonometric function.**

17. $\tan\theta\cot\theta$
18. $\sin\theta\cot\theta\tan\theta$
19. $\cos\theta + \sin\theta\tan\theta$
20. $\sin\theta\csc\theta - \cos^2\theta$
21. $\cos^2\theta\sec\theta\csc\theta$
22. $\cos\theta\left(\tan^2\theta + 1\right)$
23. $\csc\theta\left(1 - \cos^2\theta\right)$
24. $\csc\theta\cos\theta\tan\theta$
25. $\dfrac{\sin\theta}{1 - \cos^2\theta}$
26. $\dfrac{\sin^2\theta}{1 - \cos^2\theta}$
27. $\dfrac{\tan\theta}{\sin\theta\sec\theta}$
28. $\dfrac{\cos\theta}{\sin\theta\cot\theta}$
29. $\tan\theta\left(\tan\theta + \cot\theta\right)$
30. $\sin^2\theta + \cos^2\theta + \cot^2\theta$
31. $\sin^2\theta\sec\theta\csc\theta$

Verify each identity.

32. $\dfrac{\cos\theta - 1}{\cos^2\theta} = \sec\theta - \sec^2\theta$
33. $\sin^2\theta\left(\csc^2\theta - 1\right) = \cos^2\theta$
34. $\tan\theta + \cot\theta = \sec\theta\csc\theta$
35. $\dfrac{\cos\theta}{1 - \sin^2\theta} = \sec\theta$
36. $\dfrac{1 - \cos^2\theta}{\tan\theta} = \sin\theta\cos\theta$
37. $\dfrac{\csc^2\theta}{1 + \tan^2\theta} = \cot^2\theta$

Prove each fundamental identity without using any of the other fundamental identities. (*Hint:* Use the trigonometric ratios with *x*, *y*, and *r*.)

38. $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$
39. $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$
40. $1 + \cot^2\theta = \csc^2\theta$
41. $\csc\theta = \dfrac{1}{\sin\theta}$
42. $\sec\theta = \dfrac{1}{\cos\theta}$
43. $1 + \tan^2\theta = \sec^2\theta$