1–22 ■ Verify the identity.

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

2. $\dfrac{1}{1 - \sin^2 x} = 1 + \tan^2 x$

3. $\dfrac{\cos^2 x - \tan^2 x}{\sin^2 x} = \cot^2 x - \sec^2 x$

4. $\dfrac{1 + \sec x}{\sec x} = \dfrac{\sin^2 x}{1 - \cos x}$

5. $\dfrac{\cos^2 x}{1 - \sin x} = \dfrac{\cos x}{\sec x - \tan x}$

6. $(1 - \tan x)(1 - \cot x) = 2 - \sec x \csc x$

7. $\sin^2 x \cot^2 x + \cos^2 x \tan^2 x = 1$

8. $(\tan x + \cot x)^2 = \csc^2 x \sec^2 x$

9. $\dfrac{\sin 2x}{1 + \cos 2x} = \tan x$

10. $\dfrac{\cos(x + y)}{\cos x \sin y} = \cot y - \tan x$

11. $\tan \dfrac{x}{2} = \csc x - \cot x$

12. $\dfrac{\sin(x + y) + \sin(x - y)}{\cos(x + y) + \cos(x - y)} = \tan x$

29–44 ■ Solve the equation in the interval $[0, 2\pi)$.

29. $\cos x \sin x - \sin x = 0$

30. $\sin x - 2 \sin^2 x = 0$

31. $2 \sin^2 x - 5 \sin x + 2 = 0$

32. $\sin x - \cos x - \tan x = -1$

33. $2 \cos^2 x - 7 \cos x + 3 = 0$

34. $4 \sin^2 x + 2 \cos^2 x = 3$

35. $\dfrac{1 - \cos x}{1 + \cos x} = 3$

36. $\sin x = \cos 2x$

37. $\tan^3 x + \tan^2 x - 3 \tan x - 3 = 0$

38. $\cos 2x \csc^2 x = 2 \cos 2x$

39. $\tan \frac{1}{2}x + 2 \sin 2x = \csc x$

40. $\cos 3x + \cos 2x + \cos x = 0$

41. $\tan x + \sec x = \sqrt{3}$

42. $2 \cos x - 3 \tan x = 0$

55–60 ■ Find the exact value of the expression given that $\sec x = \frac{3}{2}$, $\csc y = 3$, and x and y are in quadrant I.

55. $\sin(x + y)$

56. $\cos(x - y)$

57. $\tan(x + y)$

58. $\sin 2x$

59. $\cos \dfrac{y}{2}$

60. $\tan \dfrac{y}{2}$

61–68 ■ Find the exact value of the expression.

61. $\sin^{-1}(\sqrt{3}/2)$

62. $\tan^{-1}(\sqrt{3}/3)$

63. $\cos(\tan^{-1}\sqrt{3})$

64. $\sin(\cos^{-1}(\sqrt{3}/2))$

65. $\tan\left(\sin^{-1}\frac{2}{5}\right)$

66. $\sin\left(\cos^{-1}\frac{3}{8}\right)$

67. $\cos\left(2 \sin^{-1}\frac{1}{3}\right)$

68. $\cos\left(\sin^{-1}\frac{5}{13} - \cos^{-1}\frac{4}{5}\right)$