EXERCISE 5.3

In Problems 1–8, find exact solutions over the indicated intervals (x real and θ in degrees).

1. $2\cos x + 1 = 0, \quad 0 \le x < 2\pi$
2. $2\sin x + 1 = 0, \quad 0 \le x < 2\pi$
3. $2\cos x + 1 = 0, \quad$ all real x
4. $2\sin x + 1 = 0, \quad$ all real x
5. $\sqrt{2}\sin\theta - 1 = 0, \quad 0° \le \theta < 360°$
6. $2\cos\theta - \sqrt{3} = 0, \quad 0° \le \theta < 360°$
7. $\sqrt{2}\sin\theta - 1 = 0, \quad$ all θ
8. $2\cos\theta - \sqrt{3} = 0, \quad$ all θ

In Problems 9–14, solve each to four decimal places (x real and θ in degrees).

9. $4\tan\theta + 15 = 0, \quad 0° \le \theta < 180°$
10. $2\tan\theta - 7 = 0, \quad 0° \le \theta < 180°$
11. $5\cos x - 2 = 0, \quad 0 \le x < 2\pi$
12. $7\cos x - 3 = 0, \quad 0 \le x < 2\pi$
13. $5.0118\sin x - 3.1105 = 0, \quad$ all real x
14. $1.3224\sin x + 0.4732 = 0, \quad$ all real x

B *For Problems 15–26, find exact solutions (x real and θ in degrees).*

15. $\cos x = \cot x, \quad 0 \le x < 2\pi$
16. $\tan x = -2\sin x, \quad 0 \le x < 2\pi$
17. $\cos^2\theta = \frac{1}{2}\sin 2\theta, \quad$ all θ
18. $2\sin^2\theta + \sin 2\theta = 0, \quad$ all θ
19. $\tan(x/2) - 1 = 0, \quad 0 \le x < 2\pi$
20. $\sec(x/2) + 2 = 0, \quad 0 \le x < 2\pi$
21. $\sin^2\theta + 2\cos\theta = -2, \quad 0° \le \theta < 360°$
22. $2\cos^2\theta + 3\sin\theta = 0, \quad 0° \le \theta < 360°$
23. $\cos 2\theta + \sin^2\theta = 0, \quad 0° \le \theta < 360°$
24. $\cos 2\theta + \cos\theta = 0, \quad 0° \le \theta < 360°$
25. $4\cos^2 2x - 4\cos 2x + 1 = 0, \quad 0 \le x \le 2\pi$
26. $2\sin^2(x/2) - 3\sin(x/2) + 1 = 0, \quad 0 \le x \le 2\pi$

Solve Problems 27–30 (x real and θ in degrees). Compute inverse functions to four significant digits.

27. $4\cos^2\theta = 7\cos\theta + 2, \quad 0° \le \theta \le 180°$
28. $6\sin^2\theta + 5\sin\theta = 6, \quad 0° \le \theta \le 90°$
29. $\cos 2x + 10\cos x = 5, \quad 0 \le x < 2\pi$
30. $2\sin x = \cos 2x, \quad 0 \le x < 2\pi$

Solve Problems 31 and 32 for all real solutions. Compute inverse functions to four significant digits.

31. $\cos^2 x = 3 - 5\cos x$
32. $2\sin^2 x = 1 - 2\sin x$
33. Explain the difference between evaluating the expression $\cos^{-1}(-0.7334)$ and solving the equation $\cos x = -0.7334$.
34. Explain the difference between evaluating the expression $\tan^{-1}(-5.377)$ and solving the equation $\tan x = -5.377$.

C *Find exact solutions to Problems 35–38. [Hint: Square both sides at an appropriate point, solve, then eliminate any extraneous solutions at the end.]*

35. $\sin x + \cos x = 1, \quad 0 \le x < 2\pi$
36. $\cos x - \sin x = 1, \quad 0 \le x < 2\pi$
37. $\sec x + \tan x = 1, \quad 0 \le x < 2\pi$
38. $\tan x - \sec x = 1, \quad 0 \le x < 2\pi$

Exercise 5.3

1. $2\pi/3, 4\pi/3$
3. $2\pi/3 + 2k\pi, 4\pi/3 + 2k\pi$, k any integer
5. 45°, 135°
7. $45° + k(360°), 135° + k(360°)$, k any integer
9. 104.9314° **11.** 1.1593, 5.1239
13. $0.6696 + 2k\pi, 2.4720 + 2k\pi$, k any integer
15. $\pi/2, 3\pi/2$
17. $90° + k(180°), 45° + k(180°)$, k any integer
19. $\pi/2$ **21.** 180° **23.** 90°, 270°
25. $\pi/6, 5\pi/6, 7\pi/6, 11\pi/6$ **27.** 104.5°
29. 0.9987, 5.284
31. $0.9987 + 2k\pi, -0.9987 + 2k\pi$, k any integer
33. $\cos^{-1}(-0.7334)$ has exactly one value, 2.3941; the equation $\cos x = -0.7334$ has infinitely many solutions, which are found by adding $2\pi k$, k any integer, to each solution in one period of $\cos x$.
35. $0, \pi/2$ **37.** 0 **39.** 0.002613 sec **41.** 33.21°
43. 64.1° **45.** $(r, \theta) = (1, 30°), (1, 150°)$
47. $\theta = 45°$