

*The rest are optional (see attached key)*

In Exercises 11–24, solve the equation.

11.  $2 \cos x + 1 = 0$       12.  $2 \sin x - 1 = 0$   
 13.  $\sqrt{3} \csc x - 2 = 0$       14.  $\tan x + 1 = 0$   
 15.  $3 \sec^2 x - 4 = 0$       16.  $\csc^2 x - 2 = 0$   
 17.  $2 \sin^2 2x = 1$       18.  $\tan^2 3x = 3$   
 19.  $4 \sin^2 x - 3 = 0$   
 20.  $\sin x(\sin x + 1) = 0$   
 21.  $\sin^2 x = 3 \cos^2 x$   
 22.  $\tan 3x(\tan x - 1) = 0$   
 23.  $(3 \tan^2 x - 1)(\tan^2 x - 3) = 0$   
 24.  $\cos 2x(2 \cos x + 1) = 0$

In Exercises 25–40, find all solutions of the equation in the interval  $[0, 2\pi)$ .

25.  $\cos^3 x = \cos x$       26.  $\tan^2 x - 1 = 0$   
 27.  $3 \tan^3 x = \tan x$       28.  $2 \sin^2 x = 2 + \cos x$   
 29.  $\sec^2 x - \sec x = 2$       30.  $\sec x \csc x = 2 \csc x$   
 31.  $2 \sin x + \csc x = 0$       32.  $\sin 2x = -\frac{\sqrt{3}}{2}$   
 33.  $\csc x + \cot x = 1$       34.  $\tan 3x = 1$   
 35.  $\cos \frac{x}{2} = \frac{\sqrt{2}}{2}$       36.  $\sec 4x = 2$   
 37.  $\frac{1 + \cos x}{1 - \cos x} = 0$   
 38.  $2 \sin^2 x + 3 \sin x + 1 = 0$   
 39.  $2 \sec^2 x + \tan^2 x - 3 = 0$   
 40.  $\cos x + \sin x \tan x = 2$

In Exercises 41 and 42, solve both equations. How do the solutions of the algebraic equation compare to the solutions of the trigonometric equation?

41.  $6y^2 - 13y + 6 = 0$   
 $6 \cos^2 x - 13 \cos x + 6 = 0$   
 42.  $y^2 + y - 20 = 0$   
 $\sin^2 x + \sin x - 20 = 0$

In Exercises 43–56, use a graphing utility to approximate the solutions of the equation in the interval  $[0, 2\pi)$ .

43.  $2 \cos x - \sin x = 0$   
 44.  $4 \sin^3 x + 2 \sin^2 x - 2 \sin x - 1 = 0$   
 45.  $\frac{1 + \sin x}{\cos x} + \frac{\cos x}{1 + \sin x} = 4$   
 46.  $\frac{\cos x \cot x}{1 - \sin x} = 3$   
 47.  $2 \sin x - x = 0$   
 48.  $x \cos x - 1 = 0$   
 49.  $\sec^2 x + 0.5 \tan x - 1 = 0$   
 50.  $\csc^2 x + 0.5 \cot x - 5 = 0$   
 51.  $2 \tan^2 x + 7 \tan x - 15 = 0$   
 52.  $12 \cos^2 x + 5 \cos x - 3 = 0$   
 53.  $12 \sin^2 x - 13 \sin x + 3 = 0$   
 54.  $3 \tan^2 x + 4 \tan x - 4 = 0$   
 55.  $\sin^2 x + 2 \sin x - 1 = 0$   
 56.  $4 \cos^2 x - 4 \cos x - 1 = 0$

In Exercises 57 and 58, (a) use a graphing utility to graph the function and approximate the maximum and minimum points on the graph in the interval  $[0, 2\pi)$ , and (b) solve the trigonometric equation and demonstrate that its solutions are the  $x$ -coordinates of the maximum and minimum points of  $f$ . (Calculus is required to find the trigonometric equation.)

- | Function                        | Trigonometric Equation           |
|---------------------------------|----------------------------------|
| 57. $f(x) = \sin x + \cos x$    | $\cos x - \sin x = 0$            |
| 58. $f(x) = 2 \sin x + \cos 2x$ | $2 \cos x - 4 \sin x \cos x = 0$ |

**Fixed Point** In Exercises 59 and 60, find the smallest positive fixed point of the function  $f$ . [A fixed point of a function  $f$  is a real number  $c$  such that  $f(c) = c$ .]

59.  $f(x) = \tan \frac{\pi x}{4}$   
 60.  $f(x) = \cos x$