

5.4 Solving Trigonometric Equations Algebraically

1. Solve using exact values.

a) $\cos 3x + 1 = 0$ $[0^\circ, 360^\circ)$

b) $6 \sin\left(x - \frac{\pi}{3}\right) = -3$ $0 \leq x < \frac{5\pi}{2}$

c) $\sin 3x = \frac{\sqrt{3}}{2}$ $0 \leq x < 2\pi$

d) $5 \tan\left(x - \frac{\pi}{2}\right) = 5$ $0 \leq x < 2\pi$

2. Find a general solution using exact values in radians.

a) $\sec 4x = \frac{2\sqrt{3}}{3}$

b) $\sin\left(x + \frac{\pi}{4}\right) = \frac{\sqrt{3}}{2}$

c) $\cos \frac{1}{2}\left(x - \frac{\pi}{3}\right) = \frac{\sqrt{2}}{2}$

d) $3 \tan 2\left(x - \frac{\pi}{6}\right) - 5 = -2$

Answers:

1. a) $60^\circ, 180^\circ, 300^\circ$

b) $\frac{3\pi}{2}, \frac{13}{6}$

c) $\frac{\pi}{9}, \frac{2\pi}{9}, \frac{7\pi}{9}, \frac{8\pi}{9}, \frac{13}{9}, \frac{14\pi}{9}$

d) $\frac{3\pi}{4}, \frac{7\pi}{4}$

2. a) $x = \frac{\pi}{24} + \frac{\pi}{2}n \quad n \in I$

$$x = \frac{11\pi}{24} + \frac{\pi}{2}n \quad n \in I$$

b) $x = \frac{\pi}{12} + 2n\pi \quad n \in I$

$$x = \frac{5\pi}{12} + 2n\pi \quad n \in I$$

c) $x = \frac{5\pi}{6} + 4n\pi \quad n \in I$

$$x = \frac{23\pi}{6} + 4n\pi \quad n \in I$$

d) $x = \frac{7\pi}{24} + \frac{\pi}{2}n \quad n \in I$

$$x = \frac{19\pi}{24} + \frac{\pi}{2}n \quad n \in I$$