

Identify Solutions to Trigonometric Equations, when solved over all real numbers

Solve each equation over the domain of all real numbers. Give your answers in radians.

1) $\frac{\sqrt{3}}{2} = \sin \theta$ ref $\angle = \frac{\pi}{3}$ QI & QII

$\frac{\pi}{3} + 2\pi n$
 $\frac{2\pi}{3} + 2\pi n$ } radians

2) $\tan \theta = \frac{\sqrt{3}}{3}$ ref $\angle = \frac{\pi}{6}$ QI & QIII

$\frac{\pi}{6} + 2\pi n$
 $\frac{7\pi}{6} + 2\pi n$ } radians

3) $\frac{\sqrt{3}}{2} = \cos \theta$ ref $\angle = \frac{\pi}{6}$, QI & QIV

$\frac{\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

4) $\sin \theta = -\frac{1}{2}$ ref $\angle = \frac{\pi}{6}$ QIII, QIV

$\frac{7\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

5) $2\cos \theta = -1$
 $\cos \theta = -\frac{1}{2}$ ref $\angle = \frac{\pi}{3}$, QII, QIII

$\frac{2\pi}{3} + 2\pi n$
 $\frac{4\pi}{3} + 2\pi n$ } radians

6) $-4\cos \theta = -2\sqrt{3}$ ref $\angle = \frac{\pi}{6}$, QI, QIV
 $\cos \theta = \frac{\sqrt{3}}{2}$

$\frac{\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

7) $-\frac{1}{2} \cdot \tan \theta = -\frac{1}{2}$ ref $\angle = \frac{\pi}{4}$, QI, QIII
 $\tan \theta = 1$

$\frac{\pi}{4} + 2\pi n$
 $\frac{5\pi}{4} + 2\pi n$ } radians

8) $6\cos \theta = 3\sqrt{2}$ ref $\angle = \frac{\pi}{4}$ QI, QIV
 $\cos \theta = \frac{\sqrt{2}}{2}$

$\frac{\pi}{4} + 2\pi n$
 $\frac{7\pi}{4} + 2\pi n$ } radians

9) $-5 - \frac{3}{4} \cdot \tan \theta = \frac{-20 + \sqrt{3}}{4} + \frac{20}{4}$ ref $\angle = \frac{\pi}{3}$ QI & QII
 $-\frac{4}{3} \cdot \frac{3}{4} \tan \theta = \frac{\sqrt{3}}{4} - \frac{4}{3}$
 $\tan \theta = -\frac{\sqrt{3}}{3}$

$\frac{-20 + 20 - \sqrt{3}}{4} = 5 + \frac{-\sqrt{3}}{4}$
 $\frac{4}{3} \cdot \frac{-\sqrt{3}}{4} = \frac{4}{3} \cdot \frac{3}{4} \tan \theta$
 $-\frac{\sqrt{3}}{3} = \tan \theta$

same \rightarrow
 $\frac{2\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

11) $-2 - \frac{3}{2} \cdot \tan \theta = \frac{-4 + \sqrt{3}}{2} + \frac{4}{2}$ ref $\angle = \frac{\pi}{6}$ QI, QIV
 $-\frac{3}{2} \tan \theta = \frac{\sqrt{3}}{2}$, $\tan \theta = -\frac{\sqrt{3}}{3}$

$\frac{5\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

12) $\frac{16 + \sqrt{3}}{4} = 4 - \frac{3}{4} \cdot \tan \theta$ ref $\angle = \frac{\pi}{6}$ QI, QIV
 $\frac{\sqrt{3}}{4} = -\frac{3}{4} \tan \theta$
 $\tan \theta = -\frac{\sqrt{3}}{3}$

$\frac{5\pi}{6} + 2\pi n$
 $\frac{11\pi}{6} + 2\pi n$ } radians

13) $(\sin x)^2 + 4\sin x = -3$
 $m^2 + 4m + 3 = 0$
 $(m+3)(m+1) = 0$
 $\sin x + 3 = 0$
 $\sin x = -3$
extraneous
 $\sin x + 1 = 0$
 $\sin x = -1$

$x = \frac{3\pi}{2} + 2\pi n$
radians

14) $2(\cos x)^2 + 3x = -1$
 $2m^2 + 3m + 1 = 0$
 $(2m+1)(m+1) = 0$
 $2m = -1$ $m = -\frac{1}{2}$
 $m = -1$
 $\cos x = \frac{1}{2}$ $\cos x = -1$
 $x = \frac{2\pi}{3} + 2\pi n$ radians
 $x = \frac{4\pi}{3} + 2\pi n$ radians
 $x = \pi + 2\pi n$ radians