
Section 6.2

Trigonometric Equations I

SOLVING FOR ANGLES

For most equations involving trigonometric functions, we try to reduce the problem to equations where we try to solve for possible angles given trigonometric values.

Problem 1. Find θ in the given range that solves the given identity.

$$\cos \theta = -\frac{1}{2}$$

(a) For θ in $[0^\circ, 360^\circ)$.

(b) For all possible θ .

Problem 2. Find θ in the given range that solves the given identity.

$$\tan \frac{\theta}{2} = \sqrt{3}$$

(a) For θ in $[0^\circ, 360^\circ)$.

(b) For all possible θ .

Problem 3. Find x in radians over the given range that solves the given identity.

$$\cos 3x = \frac{\sqrt{3}}{2}$$

(a) For x over the interval $[0, 2\pi)$.

(b) For all possible x .

ADDITIONAL PRACTICE

Note: Sometimes you may not be able to find the *exact* angle, in which case you may need to consult a calculator to find an approximate solution. For these practice problems, you will only need to take 3 significant digits for you approximation. However, if possible, your answer should be exact.

Problem 4. Find all θ over the interval $[0^\circ, 360^\circ)$ that satisfies: $2 \cot x + 1 = -1$.

Problem 5. Find all possible x in radians that satisfies: $2 \sec x + 1 = \sec x + 3$.

Problem 6. Find all possible x in radians over the interval $[0, 2\pi)$ that satisfies:

$$2 \cos 2x \tan 2x - \sin 2x = \frac{\sqrt{2}}{2}$$

FACTORING TRIGONOMETRIC EQUATIONS

Problem 7. Solve for all θ over the interval $[0^\circ, 360^\circ)$ that satisfies

$$\cos \theta \sin \theta = \cos \theta$$

Problem 8. Solve for all θ over the interval $[0, 2\pi)$ that satisfies

$$\sin 2x \tan x - 3 \sin 2x = 0$$

QUADRATIC METHODS

Note: The morale of this story is that you can treat your unknowns (like, $\tan \theta$) as a variable and do what you would normally do in any algebra class for solving quadratic equations.

Problem 9. Find all x over the interval $[0, 2\pi)$ such that: $\tan^2 x - 3 \tan x + 2 = 0$.

Problem 10. Find all θ over the interval $[0^\circ, 360^\circ)$ where: $\cos^2 \theta + 6 \cos \theta + 8 = 0$.

Problem 11. Find all θ over the interval $[0^\circ, 360^\circ)$ where: $\tan \theta + 1 = 3 + 3 \cot \theta$.

ADDITIONAL PRACTICE

Problem 12. Find all θ over the interval $[0^\circ, 360^\circ)$ where: $2 \tan \theta \sin 2\theta - \tan \theta = 0$.

Problem 13. Find all x over the interval $[0, 2\pi)$ where: $9 \sin^2 x - 6 \sin x = 1$.

Problem 14. Find **all possible** x , in radians, where: $\sin^2 x = \sin x + 1$.