Course Number

Instructor

Date

Section 5.3 Solving Trigonometric Equations

Objective: In this lesson you learned how to use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations.

I. Introduction (Pages 387–389)

What you should learn
How to use standard algebraic techniques to solve trigonometric equations

To solve a trigonometric equation, use standard algebraic techniques such as collecting like terms and factoring.

The preliminary goal in solving trigonometric equations is to isolate the trigonometric function in the equation.

How many solutions does the equation $\sec x = 2$ have? Explain.

The equation has an infinite number of solutions because the secant function has a period of 2π. Any angles coterminal with the equation's solutions on $[0, 2\pi)$ will also be solutions of the equation.

Example 1: Solve $2\cos^2 x - 1 = 0$.

$x = \pi/4 + n\pi$, $x = 3\pi/4 + n\pi$

To solve an equation in which two or more trigonometric functions occur, collect all terms on one side and try to separate the functions by factoring or by using appropriate identities.

II. Equations of Quadratic Type (Pages 389–391)

What you should learn
How to solve trigonometric equations of quadratic type

Give an example of a trigonometric equation of quadratic type.

Answers will vary. For example, $\cos^2 x + 4\cos x + 4 = 0$.

To solve a trigonometric equation of quadratic type, factor the quadratic, or if this is not possible, use the Quadratic Formula.

Example 2: Solve $\tan^2 x + 2\tan x = -1$.

$x = 3\pi/4 + n\pi$

Care must be taken when squaring both sides of a trigonometric equation to obtain a quadratic because this procedure can introduce extraneous solutions, so any solutions must be checked in the original equation to see whether they are valid or extraneous.

III. Functions Involving Multiple Angles (Page 392)

What you should learn
How to solve trigonometric equations involving multiple angles

Give an example of a trigonometric function of multiple angles.

Answers will vary. For example, $\tan 4x$.

Example 3: Solve $\sin 4x = \frac{\sqrt{2}}{2}$.

$x = \pi/16 + n\pi/2$ and $x = 3\pi/16 + n\pi/2$

IV. Using Inverse Functions (Page 393)

What you should learn
How to use inverse trigonometric functions to solve trigonometric equations

Example 4: Use inverse functions to solve the equation $\tan^2 x + 4\tan x + 4 = 0$.

$x = \arctan(-2) + n\pi$

Homework Assignment

Page(s)

Exercises