

Section  
5.3 Part 2

## Solving Trigonometric Equations

Objective:

Given an equation students will use algebraic techniques and inverse trigonometric functions to solve trigonometric equations.

### Study Problems

Pg. 400 # 17-18, 21-24

## Example

Solve the equation, state all solutions

$$3 \tan^2 x - 1 = 0$$

$$\begin{aligned} 3 \tan^2 x &= 1 \\ \sqrt{\tan^2 x} &= \sqrt{\frac{1}{3}} \end{aligned}$$

$$\tan x = \pm \frac{1}{\sqrt{3}}$$

$$\tan x = \pm \frac{\sqrt{3}}{3}$$

$$x = \frac{\pi}{6} + \pi k$$

$$x = \frac{5\pi}{6} + \pi k$$

Solve the equation, find solutions for interval

$$2\cos^2 x + 3\sin x - 3 = 0 \quad \rightarrow 2x^2 + 3x - 3 = 0$$

$$\sin \boxed{3}x = \frac{1}{2}$$

$$\frac{3x}{3} = \frac{\frac{\pi}{6}}{3} + \frac{2\pi k}{3}$$

$$\frac{3x}{3} = \frac{5\pi}{6} + \frac{2\pi k}{3}$$

$$x = \frac{\pi}{18} + \frac{2\pi k}{3}, \quad x = \frac{5\pi}{18} + \frac{2\pi k}{3}$$

where  $k$  is integer

Example

Solve the equation,  
find solutions for  
interval  $[0, 2\pi]$

$$2 - \sec 2x = 0$$

$$2\sin 2t + 1 = 0$$

$$2\sin 2t = -1$$

$$\sin 2t = -\frac{1}{2}$$

$$\frac{2x}{2} = \frac{7\pi}{6} + \frac{2\pi k}{2} \quad \& \quad \frac{2x}{2} = \frac{11\pi}{6} + \frac{2\pi k}{2}$$

$$x = \frac{7\pi}{12} + \pi k \quad \& \quad x = \frac{11\pi}{12} + \pi k$$

Solve the equation, state all solutions

$$2 \cos 3t - 1 = 0$$

$$2 \cos 3t = 1$$

$$\cos 3t = \frac{1}{2}$$

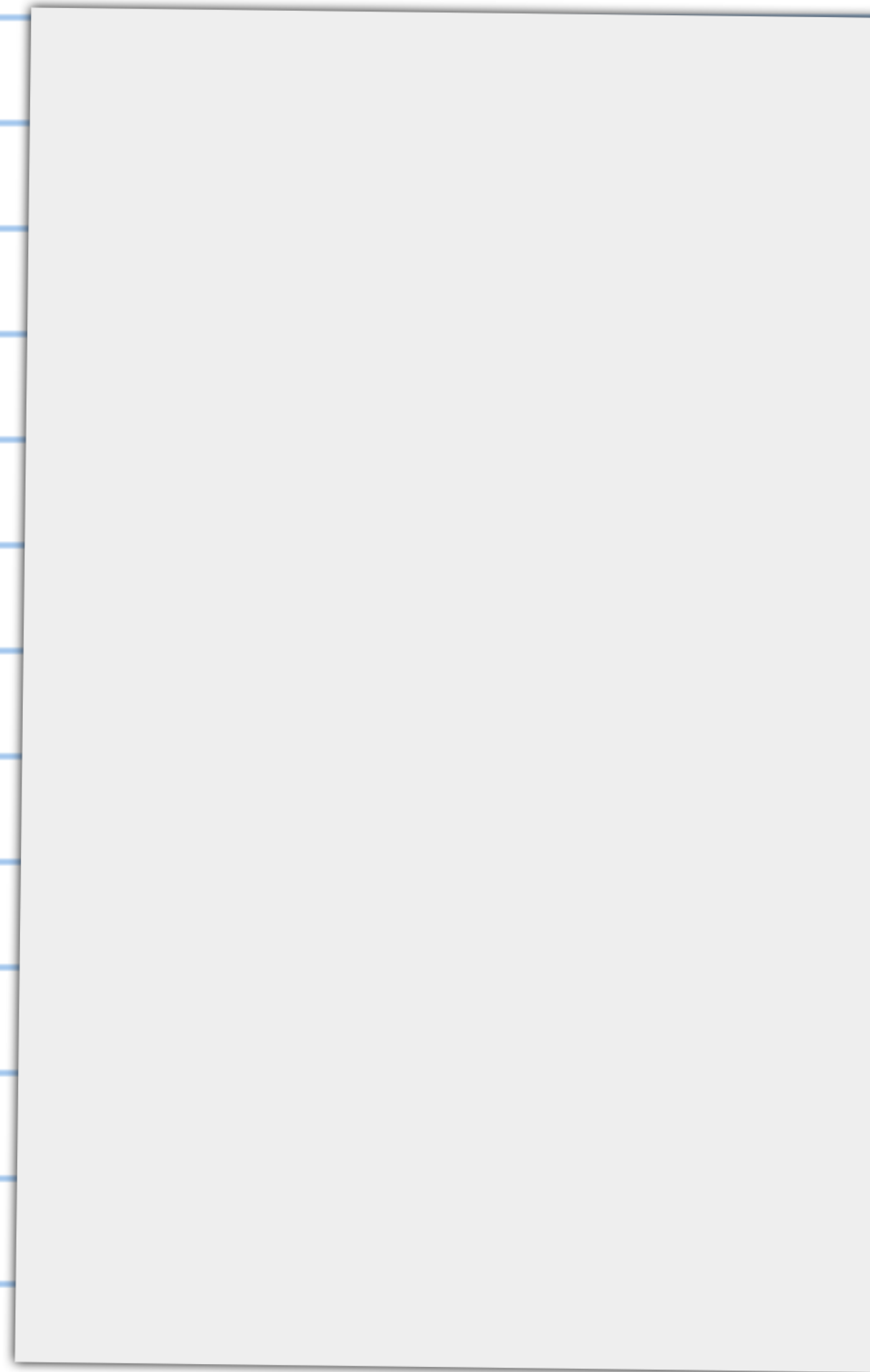
$$3t = \frac{\pi}{3}, 3t = \frac{5\pi}{3}$$

$$t = \frac{\pi}{9}, t = \frac{5\pi}{9}$$

$$t = \frac{\pi}{9} + \frac{2\pi k}{3}$$

$$t = \frac{5\pi}{9} + \frac{2\pi k}{3}$$

$k \in \mathbb{Z}$





Example

Solve the equation, state all solutions

$$3 \tan\left(\frac{x}{2}\right) + 3 = 0$$

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

$$3 \tan \frac{x}{2} = -3$$

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

$$\tan \frac{x}{2} = -1$$

$$x - \frac{\pi}{3} = \frac{\pi}{6} + 2\pi k$$

$$\frac{x}{2} = \frac{3}{4}\pi + \pi k$$

$$x - \frac{\pi}{3} = \frac{5\pi}{6} + 2\pi k$$

$$x = \frac{3\pi}{2} + 2\pi k$$

$$x = \frac{\pi}{2} + 2\pi k \quad \& \quad x = \frac{7\pi}{6} + 2\pi k$$

$$k \in \mathbb{Z}$$