

Section  
5.3 Part 1

## Solving Trigonometric Equations

Objective:

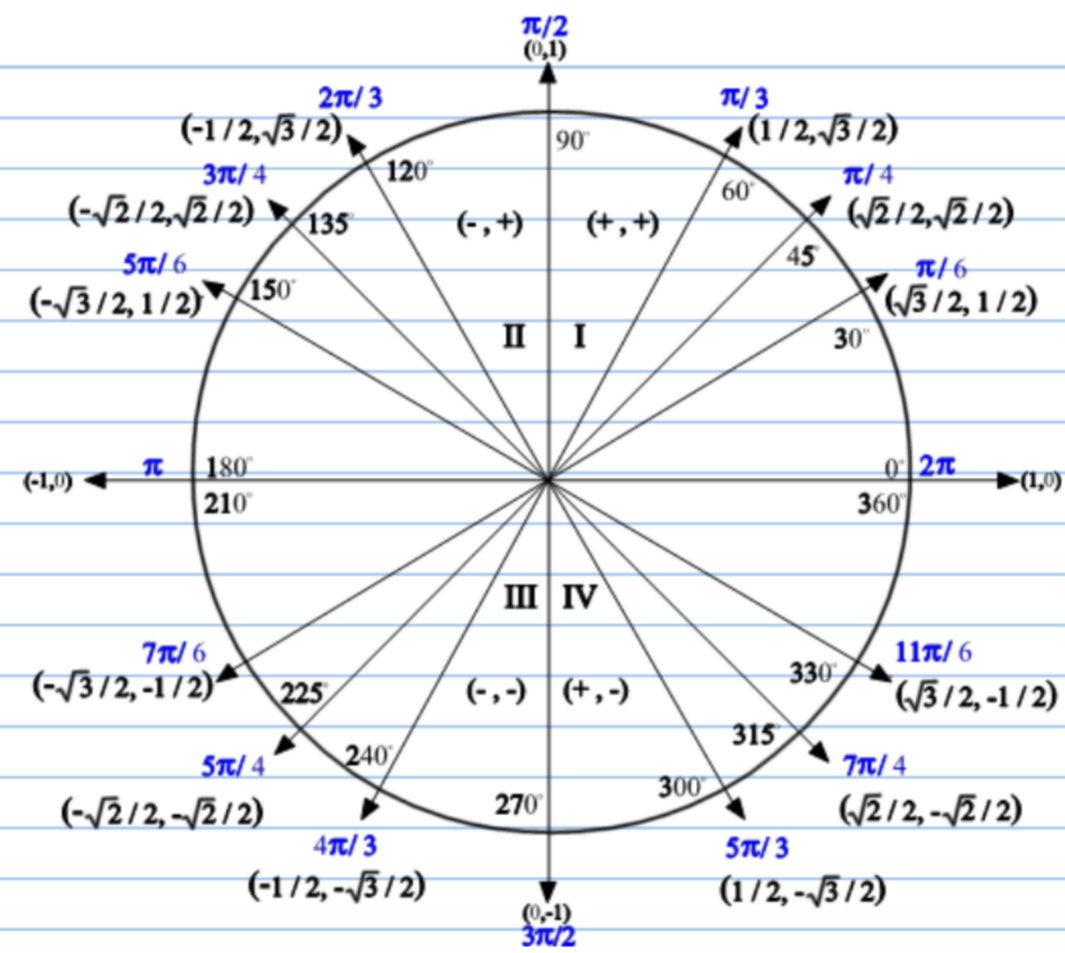
Given an equation students will use algebraic techniques and inverse trigonometric functions to solve trigonometric equations.

### Study Problems

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# 1-6, 11-14



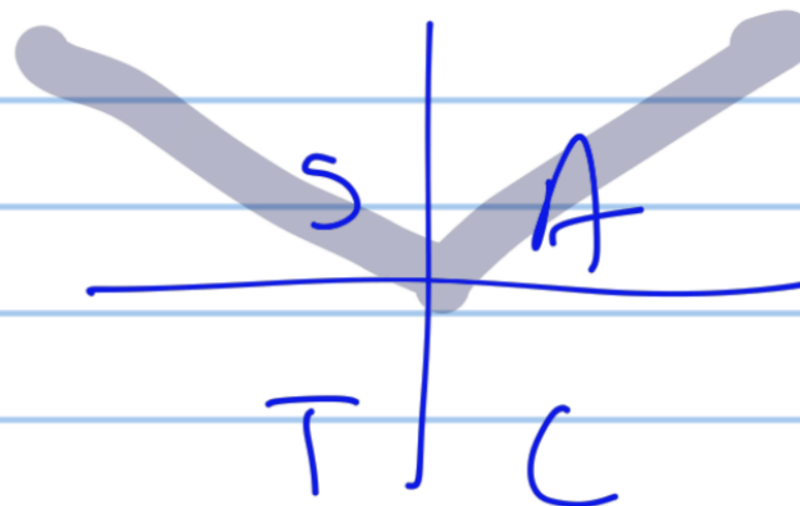


Example

Solve the equation, state all solutions

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

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



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

where  $k$   
is an integer

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

Example

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

$$\sin x + 1 = -\sin x$$

*(Red annotations:  $+\sin x$  under the first  $\sin x$ , and  $+\sin x$  under the  $-\sin x$ )*

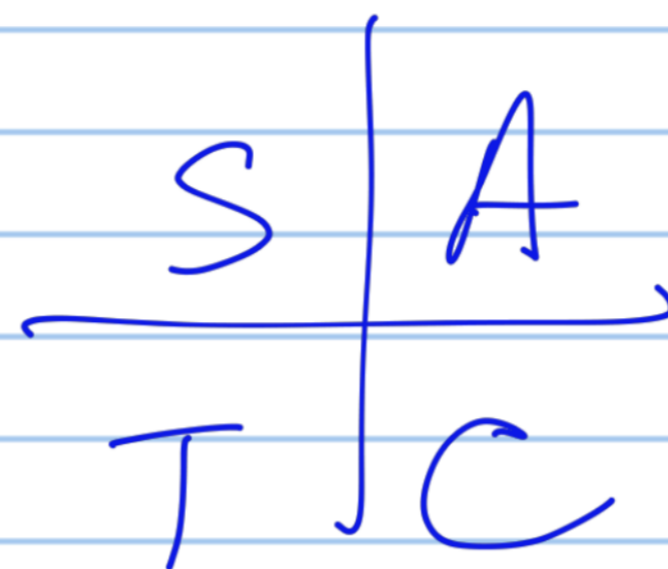
$$2\sin x + 1 = 0$$

*(Red annotations:  $+1$  and  $-1$  under the constant terms)*

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

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

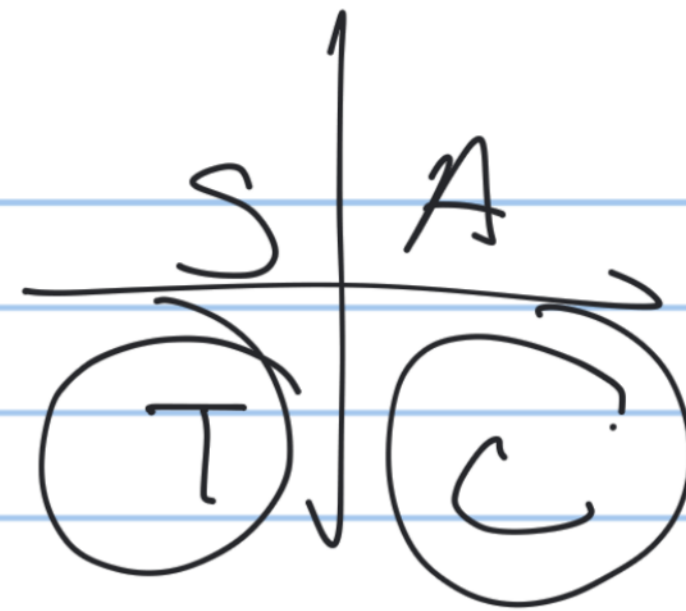
$$x = \frac{7\pi}{6}, \frac{11\pi}{6}$$



Example

Solve the equation, state all solutions

$$\sin x + \sqrt{2} = -\sin x$$



$$2 \sin x + \sqrt{2} = 0$$

$$x = \frac{5\pi}{4} + 2\pi k$$

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

$$x = \frac{7\pi}{4} + 2\pi k$$

where  $k$  is an integer

$\mathbb{Z}$

$k \in \mathbb{Z}$

Example

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

$$2 - \sec x = 0$$

$$-\sec x = -2$$

$$\sec x = 2$$

Find

$$\cos x = \frac{1}{2}$$

$$\frac{\pi}{3} \quad \& \quad \frac{5\pi}{3}$$

$$\sec = \frac{1}{x}$$

$$\cos x =$$

## Example

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

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

$$\sqrt{\tan^2 x} = \sqrt{3}$$

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

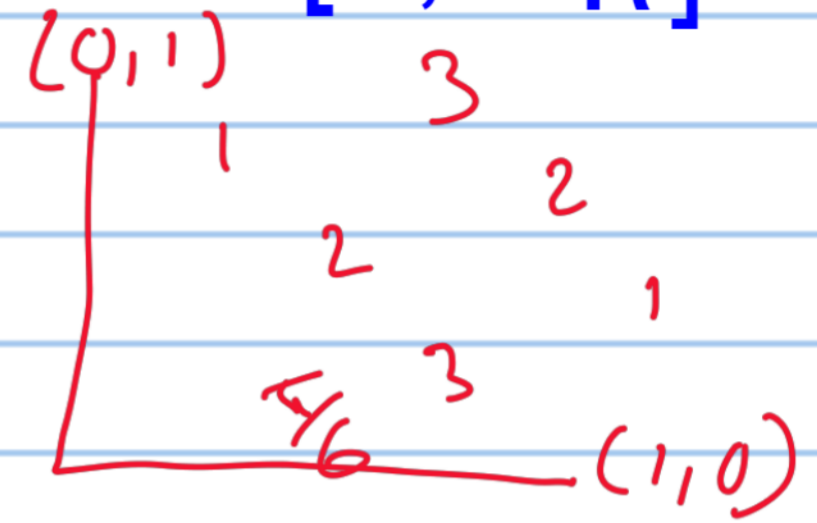
$$+\sqrt{3} \text{ \& } -\sqrt{3}$$

$$x = \frac{\pi}{3}, \frac{4\pi}{3}$$

$$x = \frac{2\pi}{3}, \frac{5\pi}{3}$$

$$\tan = \frac{y}{x}$$

$$x =$$



$$\frac{1}{2} \cdot \frac{2}{\sqrt{3}}$$

$$= \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$



## Example

Solve the equation, state all solutions

$$\text{csc } x - 2 = 0$$

$+2 \quad +2$

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$$\text{csc } x = 2$$

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

$$x = \frac{\pi}{6} + 2\pi k \quad k \in \mathbb{Z}$$
$$x = \frac{5\pi}{6} + 2\pi k$$



## Example

Solve the equation, state all solutions

$$\sec x \csc x - \csc x = 0$$

$$\csc x (\sec x - 1) = 0$$

$$\csc x = 0 \quad \& \quad \sec x - 1 = 0$$

$$\sin x = \frac{1}{0}$$

$$x = \text{undef.}$$

$$\sec x = 1$$
$$\cos x = \frac{1}{1} = 1$$

$$x = 0 + 2\pi k$$

$$x = 2\pi k$$

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