# Introduction to Trigonometric Equations

**trigonometric equation**

- an equation involving trigonometric ratios

## Focus on...

- algebraically solving first-degree and second-degree trigonometric equations in radians and in degrees
- verifying that a specific value is a solution to a trigonometric equation
- identifying exact and approximate solutions of a trigonometric equation in a restricted domain
- determining the general solution of a trigonometric equation

### Did You Know?

In equations, mathematicians often use the notation $\cos^2 \theta$. This means the same as $(\cos \theta)^2$.

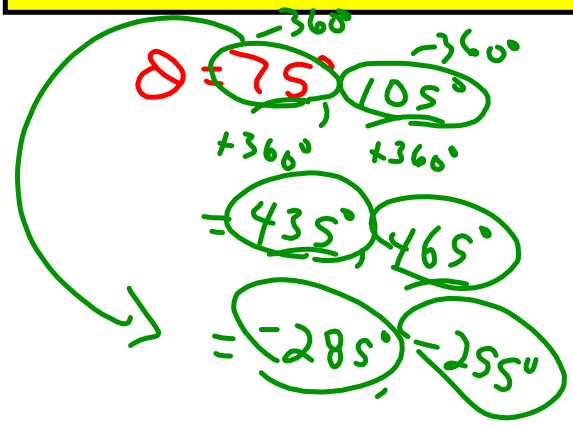
Let's start with basic LINEAR trigonometric equations...

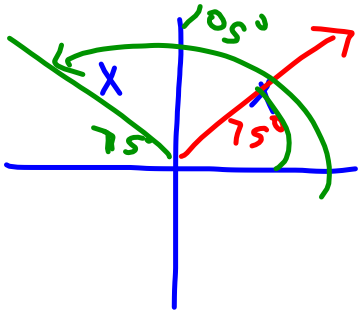
*...Pre-Calculus 110*

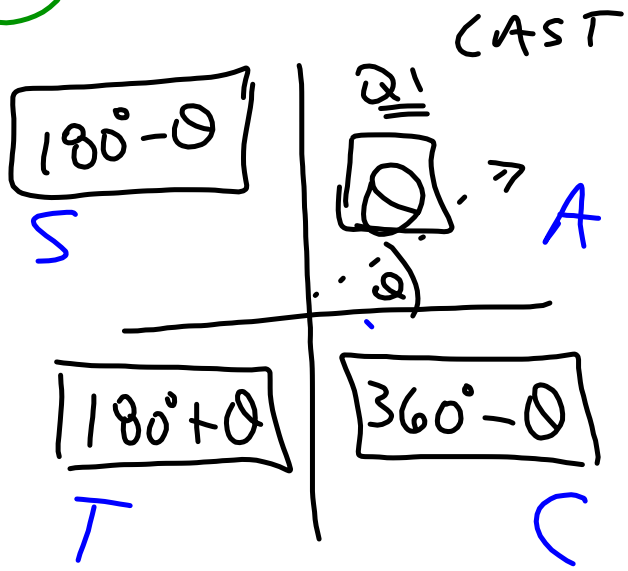
Solve: $\sin\theta = 0.9659\ ,\ -360° < \theta < 720°$

- Reference angle?
- Which quadrants?
- Any co-terminal angles acceptable?

- If the domain is in degrees, give solutions in degrees.
- If the domain is in radians, give solutions in radians.



Solve: $\sec\theta = -1.3054\ ,\ -2\pi \le x \le 2\pi$

360

(Ref ∠ 40°, Q 2, 3)

*Ignore Negative When finding Reference Angle!!!

180 − θ

x

180 + θ

x

Solution )

θ = 140°, 220°, −220°, −140°

$\theta = \frac{140\pi}{180}, \frac{220\pi}{180}, \frac{-220\pi}{180}, \frac{-140\pi}{180}$

$\theta = \pm\frac{7\pi}{9}, \pm\frac{11\pi}{9}$

$\sec\theta = -1.3054\ ,\ -2\pi \le x \le 2\pi$

(Ref ∠ 0.698, Q 2, 3)

π − θ

π + θ

Q2 ⇒ 2.44 (π − 0.698)

Q3 ⇒ 3.840 (π + 0.698)

... other 2 (− 2π)

θ = −3.843

θ = −2.44

Ex. $\sqrt{2}\cos\theta + 1 = 0, \; -360° \le \theta \le 720°$

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

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

(Ref $\measuredangle$ 45°, Q2, 3)

| 180 − θ | θ |
|---|---|
| 180 + θ | |

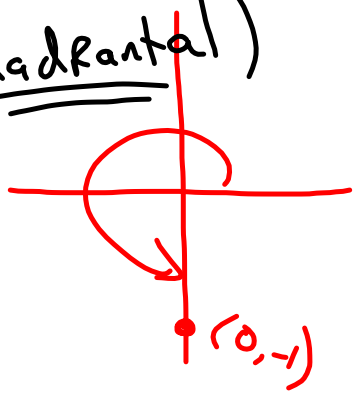
θ = 135°, 225°, 495°, 585°

Ex. $\sin x + 1 = 0, \; -2\pi \le x \le 4\pi$

$\sin x = -1$ (Quadrantal)

(y)

$x = 3\pi, \frac{7\pi}{2}, -\frac{\pi}{2}$ $+2\pi$




## Your Turn

Solve each trigonometric equation in the specified domain.

**a)** $3\cos\theta - 1 = \cos\theta + 1,\ -2\pi \le \theta \le 2\pi$

**b)** $4\sec x + 8 = 0,\ 0° \le x < 360°$

a) $3\cos\theta - 1 = \cos\theta + 1 \Rightarrow 3m - 1 = m + 1$

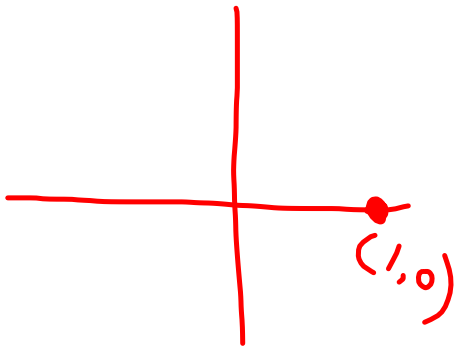
$3\cos\theta - \cos\theta = 1 + 1$

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

$\cos\theta = 1$

$(x \Rightarrow 1)$

$\theta = 0, \pm 2\pi$




b) $4\sec x + 8 = 0,\ 0° \le x < 360°$

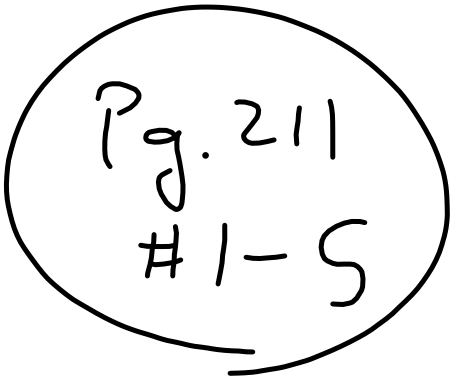
$\frac{4\sec x}{4} = \frac{-8}{4}$

$\sec x = -2$

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

(Ref ∠ 60°, Q2,3)

$\theta = 120°, 240°$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## Attachments

Worksheet - Sketching Angles in Radians.doc

Warm-Up - Intro to Limits.docx