

4.4

Introduction to Trigonometric Equations

Focus on...

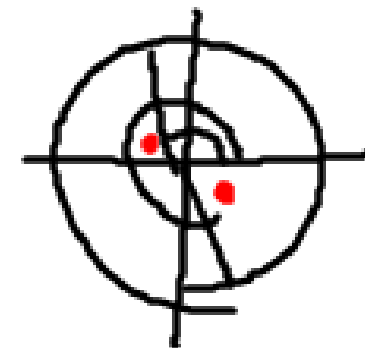
- algebraically solving first-degree and second-degree trigonometric equations in radians and in degrees
- verifying that a specific value is a solution to a trigonometric equation
- identifying exact and approximate solutions of a trigonometric equation in a restricted domain
- determining the general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

6. Copy and complete the table to express each domain or interval using the other notation.

	Domain	Interval Notation
a)	$-2\pi \leq \theta \leq 2\pi$	$\theta \in [-2\pi, 2\pi]$
b)	$-\frac{\pi}{3} \leq \theta \leq \frac{7\pi}{3}$	
c)	$0^\circ \leq \theta \leq 270^\circ$	
d)	$0 \leq \theta < \pi$	$\theta \in [0, \pi)$
e)		$\theta \in (0^\circ, 450^\circ)$
f)		$\theta \in (-2\pi, 4\pi]$

Non Unit Circle Questions

Find all solutions of each of the following equations on the given interval:



$$B) 4 \cot \theta + 3 = -2 \cot \theta - 8 \quad (0, 360^\circ)$$

$$\text{let } m = \cot \theta$$

$$4m + 3 = -2m - 8$$

$$4m + 2m = -8 - 3$$

$$6m = -11$$

$$m = \frac{-11}{6}$$

$$\cot \theta = \frac{-11}{6}$$

$$\frac{1}{\tan \theta} = \frac{-11}{6}$$

$$\tan \theta = \frac{-6}{11}$$

$$\theta = \tan^{-1}\left(\frac{-6}{11}\right)$$

$$\theta_1 = -28.61^\circ \quad (\text{QIV})$$

$$\theta_1 = 360^\circ - 28.61^\circ$$

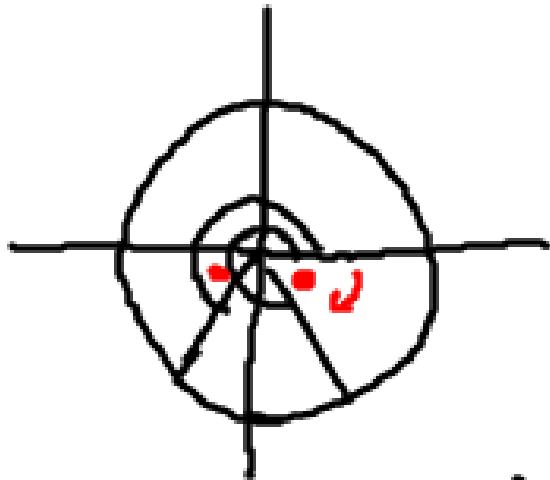
$$\theta_1 = 331.39^\circ$$

$$\theta_2 = 180^\circ - 28.61^\circ$$

$$\theta_2 = 151.39^\circ$$

$$C) \sin \theta = -0.759 \quad -180^\circ \leq \theta \leq 720^\circ$$

- degrees
- Q III + IV



$$\theta = \sin^{-1}(-0.759)$$

$$\theta_1 = -49.38^\circ \text{ (QIV)} \bullet$$

$$\theta_1 = 360^\circ - 49.38^\circ$$

$$\theta_1 = 310.62 \quad \theta_2 = 180^\circ + 49.38^\circ$$

$$\theta_2 = 229.38$$

$$\theta = \left\{ \begin{array}{l} 229.38 \\ 310.62 \end{array} + 360^\circ k, k \in \mathbb{I} \right.$$

General Solution

Interval:

$$\theta = \left\{ \begin{array}{l} 229.38^\circ, 589.38^\circ, -130.62 \\ 310.62, 670.62, -49.38 \end{array} \right.$$

Unit Circle Questions

Find all solutions of each of the following equations on the given interval:

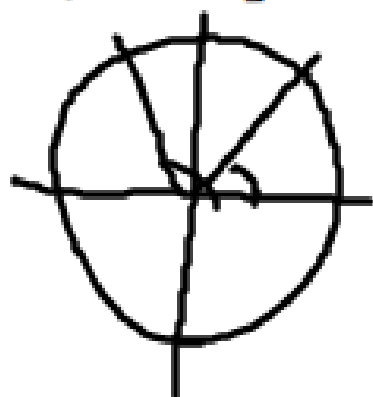
$$B) \csc \theta = \sqrt{2} \quad [-90^\circ, 400^\circ]$$

$$\frac{1}{\sin \theta} = \frac{\sqrt{2}}{1}$$

$$\sin \theta = \frac{1}{\sqrt{2}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right)$$

$$\sin \theta = \frac{\sqrt{2}}{2}$$

Q I & II



$$\theta = \begin{cases} 45^\circ \\ 135^\circ \end{cases} + 360^\circ n, n \in \mathbb{I}$$

Interval:

$$\theta = \begin{cases} 45^\circ \\ 135^\circ \end{cases}$$

$$C) \sin^2 x - 3\sin x - 4 = 0 \quad [-90^\circ, 90^\circ]$$

$$\text{let } m = \sin x$$

$$X = 270^\circ + 360^\circ n, n \in \mathbb{I}$$

$$m^2 - 3m - 4 = 0$$

Quadratic ch3

interval: $x = -90^\circ$

$$(m - 4)(m + 1) = 0$$

$$m = 4 \quad m = -1$$

$$\sin x = 4$$

$$\sin x = -1$$

$$x = \sin^{-1}(4)$$

$$x = \sin^{-1}(-1)$$

= ERROR?!?

$$x = 270^\circ$$

NO SOLN

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$$F) 12 \cos^2 x - 12 = 0$$

$$[-90^\circ, 90^\circ]$$

$$\text{let } a = \cos x$$

$$\frac{12a^2 - 12}{12} = \frac{0}{12}$$

$$a^2 - 1 = 0$$

$$(a+1)(a-1) = 0$$

$$a = -1 \quad a = 1$$

$$\cos x = -1 \quad \cos x = 1$$

OR

$$a^2 = 1$$
$$\sqrt{a^2} = \sqrt{1}$$
$$a = \pm 1$$

$$\cos x = -1$$

$$x = \{ 180^\circ \}$$

$$x = 0^\circ$$

$$\cos x = 1$$

$$x = \{ 0^\circ, 360^\circ \}$$

Solve the following trigonometric equations:

$$(a) 2 \csc^2 \theta - 8 = 0$$

for all θ in radians

$$\text{let } \csc \theta = m$$

$$\frac{2m^2 - 8}{0} = \frac{0}{2}$$

$$m^2 - 4 = 0$$

$$(m-2)(m+2) = 0$$

$$m = 2 \quad m = -2$$

$$\csc \theta = 2 \quad \csc \theta = -2$$

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

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

Q I + II

$$\theta = \left\{ \begin{array}{l} \frac{\pi}{6} \\ \frac{5\pi}{6} \end{array} \right. + 2\pi k, k \in \mathbb{I}$$

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

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

Q III + IV

$$\theta = \left\{ \begin{array}{l} \frac{7\pi}{6} \\ \frac{11\pi}{6} \end{array} \right. + 2\pi k, k \in \mathbb{I}$$

HW pg 211 # 5, 7, 9, 16, 21
I love Superhard
for now