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 $(\cos \theta)^2$.

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Sin 78° = $\frac{\sin(78)}{.9781476007}$

Cos 134° = $\frac{\sin(78)}{.9781476007}$ $\frac{\cos(134)}{-.6946583705}$ ∎

Csc 43° = $\frac{\sin(43)^{-1}}{1.466279186}$ ∎

Sec 200° = $\frac{\cos(200)^{-1}}{-1.064177772}$

Find Angles...

Cos A = 0.4382

A = $\frac{\cos^{-1}(.4382)}{64.01090966}$

Csc θ = 1.3847

$\frac{\sin^{-1}(1.3847^{-1})}{46.23460153}$

cot θ = 0.7439

θ = $\frac{\tan^{-1}(.7439^{-1})}{53.3544408}$

$$\text{Sec}\left(\frac{27\pi}{5}\right) =$$

```
cos(27π/5)
        -.3090169944
Ans⁻¹
        -3.236067978
■
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$$\text{Cot}(14.37) =$$

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tan(14.37)
        -4.217029776
Ans⁻¹
        -.2371337299
■
```

$$\text{Sec } \theta = 1.4793 \quad \theta \text{ in Rad?}$$

$$\theta =$$

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cos⁻¹(1.4793⁻¹)
        .8284816725
■
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Let's start with basic LINEAR trigonometric equations...

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.

$\sin \alpha = {}^{+}_{-}0.9659$

$\left(\text{Ref} \angle \ \underline{75°} , \ Q \ \underline{1}, \underline{2} \right)$

Must be positive angle

$*$ Never input negative sign when finding angle

$\theta = \underline{\underline{75°}}$

$+360°$

$= \underline{\underline{435°}} , \underline{\underline{465°}}$

$180° - 75° \ -360°$

$= \underline{\underline{105°}}$

$+360°$

$= -\underline{\underline{285°}} , \underline{\underline{255°}}$

$$\begin{array}{c|c} \pi - \theta & \\ 180 - \theta & \theta \\ \hline 180 + \theta & 360 - \theta \\ \pi + \theta & 2\pi - \theta \end{array}$$

$$\cos\theta = -0.7587 \quad , \quad -720° \leq \theta \leq 720°$$

$$(\text{Ref} \angle 41°, \, Q\, 2,3)$$

$$\theta = 139°, 221°$$
$$499°, 581°$$
$$-221°, -139°$$
$$-581°, -499°$$

$180°-\theta$	θ
$180°+\theta$	$360°-\theta$

x $180°-\theta$

x $180°+\theta$
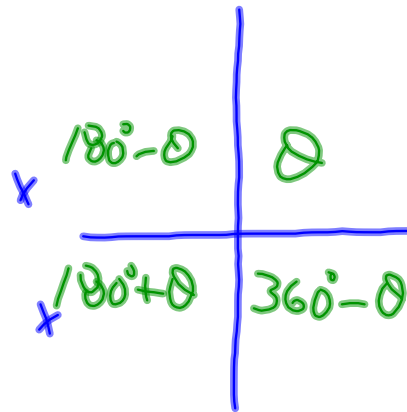
Solve: $\sec\theta = -1.3054$, $-2\pi \le x \le 2\pi$

(Ref★ 0.698, Q 2,3)

$\theta = \pi - 0.698$
$= 2.44\,Rad$ Q2

$\theta = \pi + 0.698$
$= 3.84\,Rad$ Q3

$\theta = 2.44 - 2\pi$
$= -3.84\,Rad$

$\theta = -2.44\,Rad$

$\pi - \theta$ | θ
$\pi + \theta$ | $2\pi - \theta$

OR (40°, Q 2,3)
$\theta = \pm 140°, \pm 220°,$

$\theta = \pm \dfrac{140\pi}{180}, \pm \dfrac{220\pi}{180}$

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