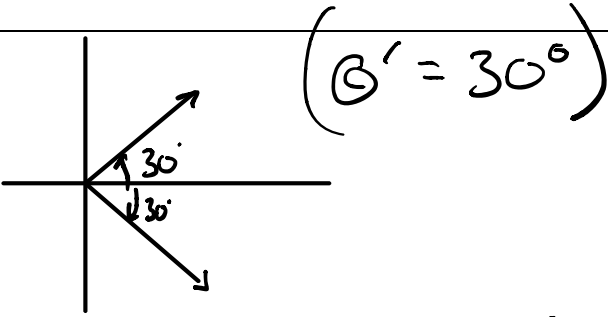


Notes 9.5 Solving Trigonometric Equations

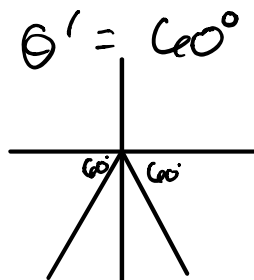
Consider the trigonometric equation $\sec \theta = \frac{2\sqrt{3}}{3}$. The plan outlined below is the process that you will perform when solving a trigonometric equation of this form. We are looking for two values of θ such that $0^\circ < \theta \leq 360^\circ$ WITHOUT using a calculator.

1. If necessary, rewrite the equation in terms of sin, cos, or tan.	$\sec \theta = \frac{2\sqrt{3}}{3}$ $\cos \theta = \frac{3}{2\sqrt{3}} = \frac{3\sqrt{3}}{2 \cdot 3} = \frac{\sqrt{3}}{2}$
2. Make a note of the two possible quadrants of termination for θ based upon the sign of ϑ .	$\cos \theta = \frac{x}{r} > 0, \text{ then } \theta \text{ terminates to the right of } y\text{-axis.}$
3. Take the inverse trig ratio of both sides of the equation to find an angle that satisfies the equation. Since you are doing this without a calculator, the angle should be an angle on the unit circle.	$\cos \theta = \frac{\sqrt{3}}{2}$ $\theta = \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$
4. Draw the angle found in step #3 in standard position. This angle should terminate in one of the two quadrants mentioned in step #2.	 <p>$(\theta' = 30^\circ)$</p>
5. Draw the second angle in standard position. This angle should have the same reference angle as your first angle and terminate in the other of the two quadrants you mentioned in step #2.	<p>$\theta = 30^\circ, 330^\circ$</p>

Use the plan described above to solve the equation $\sin \theta = -\frac{\sqrt{3}}{2}$. Show your analysis.

$$\sin \theta = -\frac{\sqrt{3}}{2} = \frac{y}{r} < 0, \text{ thus } \theta \text{ terminates below } x\text{-axis}$$

$$\theta = \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$



$$\theta = 180^\circ + 60^\circ = 240^\circ$$

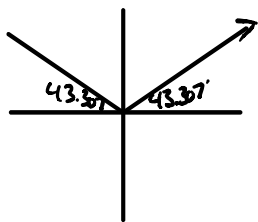
$$\theta = 360^\circ - 60^\circ = 300^\circ$$

Solve each of the following trigonometric equations finding two values for θ if $0^\circ < \theta \leq 360^\circ$. Give your answers to the nearest thousandth of a degree. Show your work including your graphical analysis.

1. $\sin \theta = 0.735$ **QUAD I or II**

$$\theta = \sin^{-1}(0.735) \quad \theta' = 43.307^\circ$$

$$\theta = 43.307^\circ$$



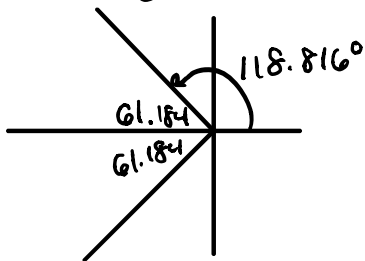
$$\theta = 43.307^\circ$$

$$\theta = 180^\circ - 43.307^\circ = 136.693^\circ$$

2. $\cos \theta = -0.482$ **QUAD II or III**

$$\theta = \cos^{-1}(-0.482) \quad \theta' = 61.184^\circ$$

$$\theta = 118.816^\circ$$



$$\theta = 118.816^\circ$$

$$\theta = 180^\circ + 61.184^\circ = 241.184^\circ$$

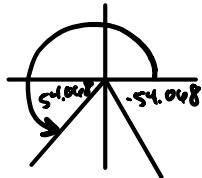
Solve each of the following trigonometric equations finding two values for θ if $0^\circ < \theta \leq 360^\circ$. Give your answers to the nearest thousandth of a degree. Show your work including your graphical analysis.

3. $\csc \theta = -1.235$ **QUAD III or IV**

$$\theta = \sin^{-1}\left(\frac{-1}{1.235}\right)$$

$$\theta \approx -54.068^\circ$$

$$\theta' = 54.068^\circ$$



$$\theta = 180^\circ + 54.068^\circ = 234.068^\circ$$

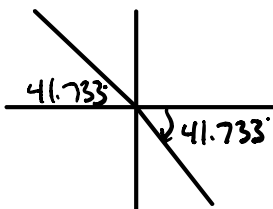
$$\theta = 360^\circ - 54.068^\circ = 305.932^\circ$$

4. $\tan \theta = -0.892$ **QUAD II or IV**

$$\theta = \tan^{-1}(-0.892)$$

$$\theta = -41.733^\circ$$

$$\theta' \approx 41.733^\circ$$



$$\theta = 180^\circ + 41.733^\circ = 221.733^\circ$$

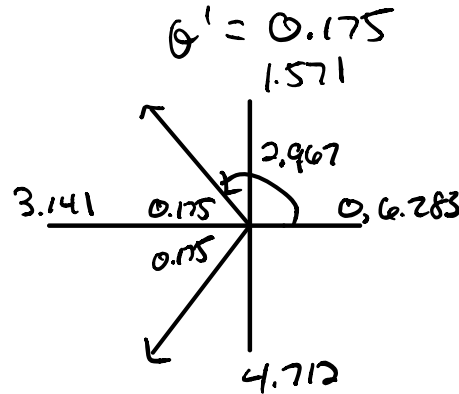
$$\theta = 360^\circ - 41.733^\circ = 318.267^\circ$$

Solve each of the following trigonometric equations finding two values for θ if $0 < \theta \leq 2\pi$. Give your answers to the nearest thousandth of a radian. Show your work including your graphical analysis.

5. $\cos \theta = -0.9848$ **QUAD II or IV**

$$\theta = \cos^{-1}(-0.9848)$$

$$\theta \approx 2.967$$



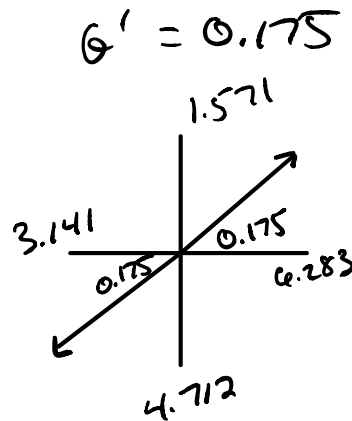
$$\theta = \pi - 0.175 = 2.967$$

$$\theta = \pi + 0.175 = 3.317$$

6. $\cot \theta = 5.671$ **QUAD I or III**

$$\theta = \cot^{-1}(5.671)$$

$$\theta = 0.175$$



$$\theta = 0.175$$

$$\theta = \pi + 0.175 = 3.317$$