

# Solving Trigonometric Equations

Example 1

$$\sin \theta \cos \theta - \frac{1}{2} \cos \theta = 0$$

\* Solutions will be angles!

$$\cos \theta (\sin \theta - \frac{1}{2}) = 0$$

$\cos \theta = 0$	$\sin \theta - \frac{1}{2} = 0$
$\cos \theta = 0$	$\sin \theta - \frac{1}{2} = 0$
$\theta = 90, 270$	$\sin \theta = \frac{1}{2}$
	$\theta = 30, 150$

	30	45	60
Sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
tan	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$

RA Q2  $180 - \theta = 30$

Solutions:  $\theta = 30^\circ, 90^\circ, 150^\circ, 270^\circ$

Example 2

$$\cos^2 \theta - \cos \theta + 1 = \sin^2 \theta$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\begin{array}{l} \cos^2 \theta - \cos \theta + 1 = 1 - \cos^2 \theta \\ + \cos^2 \theta \qquad \qquad \qquad + \cos^2 \theta \end{array}$$

$$2 \cos^2 \theta - \cos \theta = 0$$

\* move all terms to set equal to zero

$\downarrow$   $\downarrow$   
 $\cos \theta (2 \cos \theta - 1) = 0$

\* factor out cosine

$\cos \theta = 0$	$2 \cos \theta - 1 = 0$
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$\theta = 90^\circ, 270^\circ$

$$2 \cos \theta - 1 = 0$$

$$\frac{+1}{-1} \quad \frac{+1}{-1}$$

Solutions:  $60^\circ, 90^\circ$

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

$270^\circ, 300^\circ$

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

$$\theta = 60, 300$$

$$0 \leq \theta \leq 360$$

Example 3

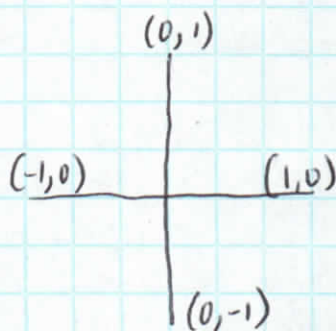
$$3 \tan^2 \theta = \sqrt{3} \tan \theta$$

\* set equal to zero!

$$3 \tan^2 \theta - \sqrt{3} \tan \theta = 0$$

$$\tan \theta (3 \tan \theta - \sqrt{3}) = 0$$

$\tan \theta = 0$	$3 \tan \theta - \sqrt{3} = 0$
$\theta = 0, 180, 360$	$\frac{3 \tan \theta}{3} = \frac{\sqrt{3}}{3}$ $\tan \theta = \frac{\sqrt{3}}{3}$ $\theta = 30^\circ, 210^\circ$



Solutions

$$\theta = 0^\circ, 30^\circ, 180^\circ, 210^\circ, 360^\circ$$

Example 4

$$\sec^2 \theta + 2 \sec \theta = 0$$

$$\sec \theta (\sec \theta + 2) = 0$$

$$\sec = \frac{1}{\cos} \text{ or } \frac{\text{hyp}}{\text{adj}}$$

$\sec \theta = 0$	$\sec \theta + 2 = 0$
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Does Not Exist

$$\sec \theta = -2$$

$$\theta = 120^\circ, 240^\circ$$

neg = Quad 2 and 3

$$\text{RA} = \underline{\underline{60}} \quad \cos = \frac{1}{2} \text{ then } \sec \theta = 2$$

Quad 2

Quad 3

$$\text{RA} = 180 - \theta = \text{RA}$$

$$\text{RA} = \theta - 180 = \text{RA}$$

$$180 - \theta = 60$$

$$\theta - 180 = 60$$

$$\theta = 120$$

$$\theta = 240$$