

Solving More Complex Trig Equations - Notes

Solve each equation for $0 \leq \theta < 2\pi$.

1) $-\sin \theta + \sqrt{2} \sin \theta \csc \theta = \sin \theta$
 $-\sin \theta \qquad \qquad \qquad -\sin \theta$

$-2 \sin \theta + \sqrt{2} \sin \theta \csc \theta = 0$

GCF
 $\sin(\theta) [-2 + \sqrt{2} \csc(\theta)] = 0$

$\sin \theta = 0 \qquad \csc \theta = \frac{2}{\sqrt{2}}$
 $\theta = \sin^{-1}(0)$

$\sin \theta = \frac{\sqrt{2}}{2}$
 $\theta = \sin^{-1}(\sqrt{2}/2)$

$\theta = 0, \pi, 2\pi$ and $\frac{\pi}{4}, \frac{3\pi}{4}$

3) $\cos^2 \theta - 2 - 3 \sin \theta = \sin^2 \theta$
 $(1 - \sin^2 \theta) - 2 - 3 \sin \theta = \sin^2 \theta$

Add/subtract to other side!

$2 \sin^2 \theta + 3 \sin \theta + 1 = 0$

$(2 \sin \theta + 1)(\sin \theta + 1) = 0$

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

$\theta = \sin^{-1}(-\frac{1}{2}) \qquad \theta = \sin^{-1}(-1)$

$\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$ and $\frac{3\pi}{2}$

2) $-1 = 3 \cot^2 \theta - 2$

$1 = 3 \cot^2(\theta)$

$\sqrt{\frac{1}{3}} = \cot^2(\theta)$

$\pm \frac{1}{\sqrt{3}} = \cot(\theta)$

$\pm \frac{\sqrt{3}}{1} = \tan \theta$

$\tan^{-1}(\pm \sqrt{3}) = \theta$

$\theta = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

4) $-\sqrt{3} \cos \theta - 2 \cos \theta = -\sin 2\theta - 2 \cos \theta$
 $\qquad \qquad \qquad + 2 \cos \theta \qquad \qquad \qquad + 2 \cos \theta$

Use Formula!

$-\sqrt{3} \cos \theta = -(2 \sin \theta \cos \theta)$

$2 \sin \theta \cos \theta - \sqrt{3} \cos \theta = 0$

GCF
 $\cos \theta [2 \sin \theta - \sqrt{3}] = 0$

$\cos \theta = 0 \qquad \sin \theta = \frac{\sqrt{3}}{2}$

$\theta = \cos^{-1}(0) \qquad \theta = \sin^{-1}(\frac{\sqrt{3}}{2})$

$\theta = \frac{\pi}{2}, \frac{3\pi}{2}$ and $\frac{\pi}{3}, \frac{2\pi}{3}$