

Section 5.3 – I.C.E – Solving Trig Equations

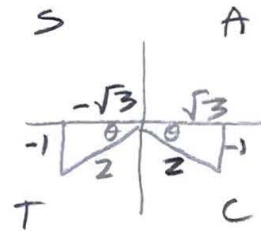
Solve the following trig equations and give all possible solutions in the interval $[0, 2\pi)$.

1. $2\sin\theta + 1 = 0$

$$2\sin\theta = -1$$

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

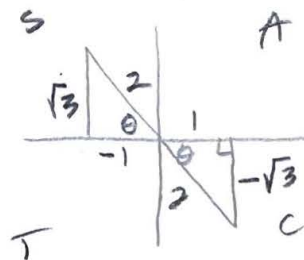
$$\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$$



2. $\tan\theta + \sqrt{3} = 0$

$$\tan\theta = -\sqrt{3}$$

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



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

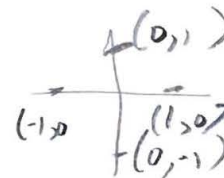
$$(2\sin\theta + 1)(\sin\theta + 1) = 0$$

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

$$\sin\theta = -1$$

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

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

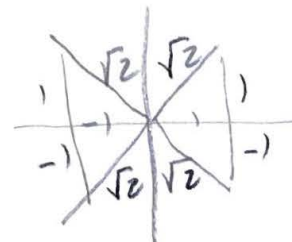


4. $2\sin^2\theta = 1$

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

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

$$\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$



5. $2\cos\theta\sin\theta - \cos\theta = 0$

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

$$\cos\theta = 0$$

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

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

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$$

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6. $\sin^2 \theta = 3\cos^2 \theta$

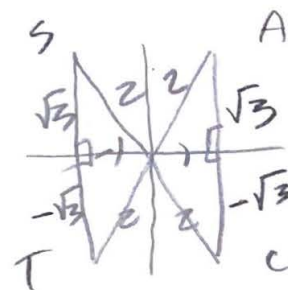
$$1 - \cos^2 \theta = 3\cos^2 \theta$$

$$1 = 4\cos^2 \theta$$

$$\frac{1}{4} = \cos^2 \theta$$

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

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



7. $\sec \theta \csc \theta = 2 \csc \theta$

$$\sec \theta \csc \theta - 2 \csc \theta = 0$$

$$\csc \theta (\sec \theta - 2) = 0$$

$$\csc \theta = 0$$

$$\frac{1}{\sin \theta} = 0$$

undefined

$$\sec \theta = 2$$

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

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

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

8. $\sec^2 x - 1 = 0$

$$\sec^2 x = 1$$

$$\sec x = \pm 1$$

$$\frac{1}{\cos x} = \pm 1$$

$$x = 0, \pi$$

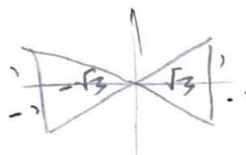
9. $(3\tan^2 x - 1)(\tan^2 x - 3) = 0$

$$\tan^2 x = \frac{1}{3}$$

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

$$\tan^2 x = 3$$

$$\tan x = \pm \sqrt{3}$$



$$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

10. $2\sin^2 x = 2 + \cos x$

$$2(1 - \cos^2 x) - \cos x - 2 = 0$$

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

$$2\cos^2 x + \cos x = 0$$

$$\cos x (2\cos x + 1) = 0$$

$$\cos x = 0$$

$$x = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$\cos x = -\frac{1}{2}$$

$$x = \frac{2\pi}{3}, \frac{4\pi}{3}$$