

Solving Trig Equations WS 1

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Solve the following equations over $[0, 2\pi)$

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

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

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

3. $\tan x - \sqrt{3} = 0$

$\tan x = \sqrt{3}$

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

5. $2\cos x - 1 = 0$

$2\cos x = 1$

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

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

7. $\tan x(\tan x - 1) = 0$

$\tan x = 0$ $\tan x - 1 = 0$

$x = 0, \pi$

$\tan x = 1$

$x = \frac{\pi}{4}, \frac{5\pi}{4}$

9. $\sin x(\sin x + 1) = 0$

$\sin x = 0$ $\sin x + 1 = 0$

$x = 0, \pi$

$\sin x = -1$

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

11. $\sec x + 2 = 0$

$\sec x = -2$

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

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

13. $\sec x \csc x - 2 \csc x = 0$

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

$\csc x = 0$

$\sin x = \frac{1}{0} = \text{undefined}$
not possible

$\sec x - 2 = 0$

$\sec x = 2$

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

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

15. $2\cos x \sin x + \cos x = 0$

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

$\cos x = 0$

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

$2\sin x + 1 = 0$

$2\sin x = -1$

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

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

17. $2\cot^2 x \sin x = \cot^2 x$

$2\cot^2 x \sin x - \cot^2 x = 0$

$\cot^2 x(2\sin x - 1) = 0$

$\cot^2 x = 0$

$\cot x = 0$

$\tan x = \text{undef.}$
 $x = \frac{\pi}{2}, \frac{3\pi}{2}$

$2\sin x - 1 = 0$

$2\sin x = 1$

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

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

2. $\sqrt{3}\sec x = 2$

$\sec x = \frac{2}{\sqrt{3}}$

$\cos x = \frac{\sqrt{3}}{2}$

$x = \frac{\pi}{6}, \frac{11\pi}{6}$

4. $\sec^2 x - 2 = 0$

$\sec^2 x = 2$

$\sec x = \pm\sqrt{2}$

$\cos x = \pm \frac{1}{\sqrt{2}}$

$\cos x = \pm \frac{\sqrt{2}}{2}$
 $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

6. $2\sin^2 x = 1$

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

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

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

$\sin x = \pm \frac{\sqrt{2}}{2}$
 $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

8. $\csc^2 x - 2 = 0$

$\csc^2 x = 2$

$\csc x = \pm\sqrt{2}$

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

$\sin x = \pm \frac{\sqrt{2}}{2}$
 $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

10. $\sqrt{3}\tan x + 1 = 0$

$\sqrt{3}\tan x = -1$

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

$\tan x = -\frac{\sqrt{3}}{3}$

$x = \frac{5\pi}{6}, \frac{11\pi}{6}$

12. $\cos x + 1 = 0$

$\cos x = -1$

$x = \pi$

14. $2\sin^2 x + 3\sin x + 1 = 0$

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

$2\sin x + 1 = 0$ $\sin x + 1 = 0$

$2\sin x = -1$

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

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

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

16. $2\sin^2 x - \sin x - 1 = 0$

$(2\sin x + 1)(\sin x - 1) = 0$

$2\sin x + 1 = 0$ $\sin x - 1 = 0$

$2\sin x = -1$

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

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

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

18. $\tan^2 x - 2\tan x + 1 = 0$

$(\tan x - 1)(\tan x - 1) = 0$

$\tan x - 1 = 0$

$\tan x = 1$

$x = \frac{\pi}{4}, \frac{5\pi}{4}$