

Solve the following equations over  $[0, 2\pi)$ .  
*include* ↓ *not included* ←

1.  $\cot x + 1 = 0$

$\cot x = -1$

$x = \frac{3\pi}{4}, \frac{7\pi}{4}$

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

$2\cos x = -1$

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

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

3.  $\sin x + 2 = 0$

$\sin x = -2$

$\emptyset$

4.  $2\sin x - 1 = 0$

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

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

5.  $\sin x + \sqrt{2} = -\sin x$

$\begin{array}{c} +\sin x \\ +\sin x \end{array}$

$2\sin x + \sqrt{2} = 0$

$2\sin x = -\sqrt{2}$

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

$x = \frac{5\pi}{4}, \frac{7\pi}{4}$

6.  $\csc^2 x + 2 = 4$

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

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

$\sin x = \pm\frac{1}{\sqrt{2}} \begin{array}{l} (\sqrt{2}) \\ (\sqrt{2}) \end{array}$

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

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

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

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

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

8.  $\sqrt{2}\sin x + 1 = 0$

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

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

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

$x = \frac{5\pi}{4}, \frac{7\pi}{4}$

9.  $7 + \cos x = 4 - 5\cos x$

$\begin{array}{c} +5\cos x \\ +5\cos x \end{array}$

$\begin{array}{c} 7 + 6\cos x = 4 \\ -7 \quad -7 \end{array}$

$6\cos x = -3$

$\cos x = -\frac{3}{6}$

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

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

10.  $-5 + 2\cos x = -2 + \cos x$

$\begin{array}{c} -\cos x \\ -\cos x \end{array}$

$\begin{array}{c} -5 + \cos x = -2 \\ +5 \quad +5 \end{array}$

$\cos x = 3$

$\emptyset$

11.  $4 + 7\cot x = -2\sqrt{3} + \cot x + 4$

$\begin{array}{c} -\cot x \\ -\cot x \end{array}$

$6\cot x = -2\sqrt{3}$

$\cot x = -\frac{2\sqrt{3}}{6}$

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

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

12.  $-6 + 3\tan x = \sqrt{3} - 6$

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

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

13.  $\tan^2 x - 3 = 0$

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

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

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

14.  $3 \tan^2 x - 1 = 0$

$$3 \tan^2 x = 1$$

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

$$\tan x = \pm \frac{1}{\sqrt{3}} \left( \frac{\sqrt{3}}{\sqrt{3}} \right)$$

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

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

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

$$\tan x = 0 \quad \tan x = 1$$

$$x = 0\pi, \pi, \frac{\pi}{4}, \frac{5\pi}{4}$$

16.  $2 \cos^2 x - \sqrt{3} \cos x = 0$

$$\cos x (2 \cos x - \sqrt{3}) = 0$$

$$\cos x = 0 \quad 2 \cos x = \sqrt{3}$$

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

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

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

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

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

~~$$\sin x = 2 \quad \sin x = -1$$~~

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

18.  $1 + \csc^2 x + \csc x = 3$

$$\csc^2 x + \csc x - 2 = 0$$

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

$$\csc x = -2 \quad \csc x = 1$$

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

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

19.  $1 + \tan^2 x + \tan x = 1$

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

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

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

$$x = 0\pi, \pi, \frac{3\pi}{4}, \frac{7\pi}{4}$$

20.  $1 - \cos^2 x + \cos x = -1$

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

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

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

~~$$\cos x = 2 \quad \cos x = -1$$~~

$$x = \pi$$

21.  $2 \sin^2 x - \sin x = 1$

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

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

$$2 \sin x = -1 \quad \sin x = 1$$

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

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

22.  $2 - 2 \cos^2 x = 2 + \cos x$

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

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

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

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

$$\cos x = 0 \quad \cos x = -\frac{1}{2}$$

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

23.  $\sec^2 x - \sec x = 2$

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

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

$$\sec x = 2 \quad \sec x = -1$$

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

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

24.  $3 \tan^3 x = \tan x$

$$3 \tan^3 x - \tan x = 0$$

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

$$\tan x = 0 \quad \tan^2 x = \frac{1}{3}$$

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

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

$$x = 0\pi, \pi, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$