

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

1. $\sin x \tan x = -\tan x$

$$\sin x \tan x + \tan x = 0$$

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

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

$$x = 0, \pi \quad x = \frac{3\pi}{2}$$

3. $(\cos^2 x - 1)(\cot x + 1) = 0$

$$\cos^2 x = 1 \quad \cot x = -1$$

$$\cos x = \pm 1$$

$$x = 0, \pi$$

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

5. $\sin^2 x \tan x = \tan x$

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

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

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

$$x = 0, \pi \quad x = \frac{\pi}{2}, \frac{3\pi}{2}$$

7. $\cos x \tan^2 x = \sqrt{3} \cos x$

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

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

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

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

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

9. $\sec x \csc x = \csc x$

$$\sec x \csc x - \csc x = 0$$

$$\csc x (\sec x - 1) = 0$$

$$\csc x = 0 \quad \sec x = 1$$

$$\sin x = \frac{1}{0} \quad \cos x = 1$$

$$x = 0, \pi$$

11. $\cot x \tan x = -\sqrt{3} \cot x$

$$\cot x \tan x + \sqrt{3} \cot x = 0$$

$$\cot x (\tan x + \sqrt{3}) = 0$$

$$\cot x = 0 \quad \tan x = -\sqrt{3}$$

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

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

2. $\cos x - \cot x = 0$

$$\cos x \left(\cos x - \frac{\cos x}{\sin x} \right) = 0$$

$$\cos x \cos x - \cos x = 0$$

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

$$\cos x = 0 \quad \sin x = 1$$

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

4. $\cos x (\sec x - 2) = 0$

$$\cos x = 0 \quad \sec x = 2$$

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

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

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

6. $-\cos x = \cot x$

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

$$\cos x = -1 \quad \cot x = -3$$

$$x = 0, \pi$$

8. $\cos x \sec x + 2 \cos x = 0$

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

$$\cos x = 0 \quad \sec x = -2$$

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

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

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

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

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

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

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

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

12. $-\sec x + \tan x = 1$

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

$$\cos x = 0 \quad \cot x = \frac{\sqrt{3}}{3}$$

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