

Solve over $[0, 2\pi)$.

<p>1. $\tan x = 2 \sin x$ $\frac{\sin x}{\cos x} = 2 \sin x \cdot \cos x$ $\sin x = 2 \sin x \cos x$ $0 = 2 \sin x \cos x - \sin x$ $0 = \sin x (2 \cos x - 1)$</p>	<p>$\sin x = 0$ $2 \cos x - 1 = 0$ $2 \cos x = 1$ $\cos x = \frac{1}{2}$ $x = 0, \pi$ $x = \frac{\pi}{3}, \frac{5\pi}{3}$</p>	<p>2. $1 + \sin x = 2 \cos^2 x$ $1 + \sin x = 2(1 - \sin^2 x)$ $1 + \sin x = 2 - 2 \sin^2 x$ $2 \sin^2 x + \sin x - 1 = 0$ $(2 \sin x - 1)(\sin x + 1) = 0$ $2 \sin x - 1 = 0$ $\sin x + 1 = 0$ $2 \sin x = 1$ $\sin x = -1$ $\sin x = \frac{1}{2}$ $\sin x = -1$ $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$</p>
<p>3. $\sin^2 x = 2 \cos x + 2$ $1 - \cos^2 x = 2 \cos x + 2$ $0 = \cos^2 x + 2 \cos x + 1$ $0 = (\cos x + 1)(\cos x + 1)$ $\cos x + 1 = 0$ $\cos x = -1$ $x = \pi$</p>	<p>4. $\tan x = \cot x$ $\tan x \cdot \tan x = \frac{1}{\tan x} \cdot \tan x$ $\tan^2 x = 1$ $\tan x = \pm 1$ $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$</p>	
<p>5. $\csc^2 x = \cot x + 1$ $\cot^2 x + 1 = \cot x + 1$ $\cot^2 x - \cot x = 0$ $\cot x (\cot x - 1) = 0$ $\cot x = 0$ $\cot x - 1 = 0$ $\cot x = 1$ $x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{4}, \frac{5\pi}{4}$</p>	<p>6. $2(\tan^2 x = -\frac{3}{2} \sec x)$ $2 \tan^2 x = -3 \sec x$ $2(\sec^2 x - 1) = -3 \sec x$ $2 \sec^2 x - 2 = -3 \sec x$ $2 \sec^2 x + 3 \sec x - 2 = 0$ $(2 \sec x - 1)(\sec x + 2) = 0$</p> <p>$2 \sec x - 1 = 0$ $\sec x + 2 = 0$ $2 \sec x = 1$ $\sec x = -2$ $\sec x = \frac{1}{2}$ $\cos x = -\frac{1}{2}$ $\cos x = 2$ $x = \frac{2\pi}{3}, \frac{4\pi}{3}$ N/A</p>	
<p>7. $\sin 3x = 1$ $\sin x \tan x = -\tan x$ $\sin x \tan x + \tan x = 0$ $\tan x (\sin x + 1) = 0$ $\tan x = 0$ $\sin x + 1 = 0$ $x = 0, \pi$ $\sin x = -1$ $x = \frac{3\pi}{2}$</p>		<p>8. $2 \sin^2 x = 3 \sin x - 1$ $2 \sin^2 x - 3 \sin x + 1 = 0$ $(2 \sin x - 1)(\sin x - 1) = 0$ $2 \sin x - 1 = 0$ $\sin x - 1 = 0$ $2 \sin x = 1$ $\sin x = 1$ $\sin x = \frac{1}{2}$ $\sin x = 1$ $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{\pi}{2}$</p>
<p>9. $2 \sin^2 x = \sqrt{3} \sin x$ $2 \sin^2 x - \sqrt{3} \sin x = 0$ $\sin x (2 \sin x - \sqrt{3}) = 0$ $\sin x = 0$ $2 \sin x - \sqrt{3} = 0$ $2 \sin x = \sqrt{3}$ $\sin x = \frac{\sqrt{3}}{2}$ $x = 0, \pi, \frac{\pi}{3}, \frac{2\pi}{3}$</p>	<p>10. $\cot^2 x + \csc^2 x = 3$ $\cot^2 x + 1 + \cot^2 x = 3$ $2 \cot^2 x + 1 = 3$ $2 \cot^2 x = 2$ $\cot^2 x = 1$ $\cot x = \pm 1$ $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$</p>	

11. $2\cos x \csc x = \sqrt{3} \csc x$
 $2\cos x \csc x - \sqrt{3} \csc x = 0$
 $\csc x(2\cos x - \sqrt{3}) = 0$
 $\csc x = 0$ $2\cos x - \sqrt{3} = 0$
 ~~$\sin x = \text{und.}$~~ $2\cos x = \sqrt{3}$
 $\cos x = \frac{\sqrt{3}}{2}$
 $x = \frac{\pi}{6}, \frac{11\pi}{6}$

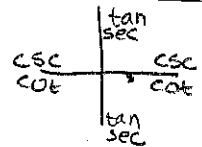
12. $3\cos x + 3 = 2\sin^2 x$
 $3\cos x + 3 = 2(1 - \cos^2 x)$
 $3\cos x + 3 = 2 - 2\cos^2 x$
 $2\cos^2 x + 3\cos x + 1 = 0$
 $(2\cos x + 1)(\cos x + 1) = 0$
 $2\cos x + 1 = 0$ $\cos x + 1 = 0$
 $2\cos x = -1$ $\cos x = -1$
 $\cos x = -\frac{1}{2}$
 $x = \frac{2\pi}{3}, \frac{4\pi}{3}, \pi$

13. $\tan^2 x = \sqrt{3} \tan x$
 $\tan^2 x - \sqrt{3} \tan x = 0$
 $\tan x(\tan x - \sqrt{3}) = 0$
 $\tan x = 0$ $\tan x - \sqrt{3} = 0$
 $x = 0, \pi$ $\tan x = \sqrt{3}$
 $x = \frac{\pi}{3}, \frac{4\pi}{3}$

14. $(\tan x - 1)(\sec x - 1) = 0$
 $\tan x - 1 = 0$ $\sec x - 1 = 0$
 $\tan x = 1$ $\sec x = 1$
 $x = \frac{\pi}{4}, \frac{5\pi}{4}$ $\cos x = 1$
 $x = 0$

15. $\sec^2 x - 2\tan x = 0$
 $1 + \tan^2 x - 2\tan x = 0$
 $\tan^2 x - 2\tan x + 1 = 0$
 $(\tan x - 1)(\tan x - 1) = 0$
 $\tan x - 1 = 0$
 $\tan x = 1$
 $x = \frac{\pi}{4}, \frac{5\pi}{4}$

16. $\tan 2x = 0$
 $(\sin^2 x - 1)(\tan x + 1) = 0$
 $\sin^2 x - 1 = 0$ $\tan x + 1 = 0$
 $\sin^2 x = 1$ $\tan x = -1$
 $\sin x = \pm 1$
 ~~$x = \frac{\pi}{2}, \frac{3\pi}{2}$~~
 $x = \frac{3\pi}{4}, \frac{7\pi}{4}$



17. $3\cos x + \sqrt{2} = \cos x$
 $-2\cos x + \sqrt{2} = 0$
 $2\cos x + \sqrt{2} = 0$
 $2\cos x = -\sqrt{2}$
 $\cos x = -\frac{\sqrt{2}}{2}$
 $x = \frac{3\pi}{4}, \frac{5\pi}{4}$

18. $(\sec^2 x - 2)(\csc x + 1) = 0$
 $\sec^2 x - 2 = 0$ $\csc x + 1 = 0$
 $\sec^2 x = 2$ $\csc x = -1$
 $\sec x = \pm\sqrt{2}$ $\sin x = -1$
 $\cos x = \pm\frac{1}{\sqrt{2}}$ ~~$x = \frac{3\pi}{2}$~~
 $\cos x = \pm\frac{\sqrt{2}}{2}$
 $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

19. $\cot x(\csc x + 2) = 0$
 $\cot x = 0$ $\csc x + 2 = 0$
 $\tan x = \text{und.}$ $\csc x = -2$
 $x = \frac{\pi}{2}, \frac{3\pi}{2}$ $\sin x = -\frac{1}{2}$
 $x = \frac{7\pi}{6}, \frac{11\pi}{6}$

20. $4\cos^2 2x = 3$
 $2\cos^2 x - 7\cos x = -3$
 $2\cos^2 x - 7\cos x + 3 = 0$
 $(2\cos x - 1)(\cos x - 3) = 0$
 $2\cos x - 1 = 0$ $\cos x - 3 = 0$
 $2\cos x = 1$ ~~$\cos x = 3$~~
 $\cos x = \frac{1}{2}$
 $x = \frac{\pi}{3}, \frac{5\pi}{3}$

$$21. 6\sin 2x - 3 = 0$$

$$6\sin 2x = 3$$

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

$$2x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}$$

$$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$$

$$22. \tan 3x(\tan x - 1) = 0$$

$$\tan 3x = 0$$

$$3x = 0, \pi, 2\pi, 3\pi, 4\pi, 5\pi$$

$$\tan x - 1 = 0$$

$$\tan x = 1$$

$$x = 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}$$

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

$$23. 3\tan^2 2x = 1$$

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

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

$$\tan 2x = \pm \frac{\sqrt{3}}{3}$$

$$2x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}, \frac{19\pi}{6}, \frac{23\pi}{6}$$

$$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$$

$$24. 4\sec 3x + 8 = 0$$

$$4\sec 3x = -8$$

$$\sec 3x = -2$$

$$\cos 3x = -\frac{1}{2}$$

$$3x = \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{8\pi}{3}, \frac{10\pi}{3}, \frac{14\pi}{3}, \frac{16\pi}{3}$$

$$x = \frac{2\pi}{9}, \frac{4\pi}{9}, \frac{8\pi}{9}, \frac{10\pi}{9}, \frac{14\pi}{9}, \frac{16\pi}{9}$$