

1. Given $\sin x = \frac{4}{7}$ and $\cos x = -\frac{\sqrt{33}}{7}$, find $\cot x$.
2. Given $\cos\left(\frac{\pi}{2} - x\right) = \frac{2}{7}$, find $\sin x$.
3. Given $\csc x = -3$ and $\tan x > 0$, find $\cos x$.
4. Simplify: $\frac{\csc x}{\tan x + \cot x}$
5. Simplify: $\frac{\sin^2 x}{\sec^2 x - 1}$
6. Simplify: $\frac{\cos(-x)}{\sin(-x)}$
7. Factor and simplify: $\cot^4 x + 2\cot^2 x + 1$
8. Perform the addition and simplify: $\frac{\tan x}{\csc x} + \frac{\sin x}{\tan x}$
9. Simplify: $\frac{1 - \csc x}{\csc x}$
10. Simplify: $\frac{\cos x}{1 + \sin x}$
11. Verify the identity: $\frac{\sec^2 x}{\cot x} - \tan^3 x = \tan x$
12. Verify the identity: $\frac{\csc x}{\sin x} - \frac{\cot x}{\tan x} = 1$
13. Verify the identity: $\tan^2 x \cos^2 x + \cot^2 x \sin^2 x = 1$
14. Verify the identity: $\sin x \left(\frac{\sin x}{1 - \cos x} + \frac{1 - \cos x}{\sin x} \right) = 2$
15. Verify the identity: $\sec x \csc^2 x - \csc^2 x = \frac{\sec x}{1 + \cos x}$
16. Verify the identity: $\frac{\cos x}{1 - \sin^2 x} = \sec x$
17. Verify the identity algebraically $\frac{\csc^4 x - 1}{\cot^2 x} = 2 + \cot^2 x$
18. Find all the solutions: $2 \cos x - \sqrt{3} = 0$
19. Find all the solutions: $\csc x + 2 = 0$
20. Find all the solutions in the interval $[0, 2\pi)$: $\cot^2 x - \tan^2 x = 0$
21. Find all the solutions in the interval $[0, 2\pi)$: $\sec^2 x = \sec x + 2$
22. Find all the solutions in the interval $[0, 2\pi)$: $3 \tan^2 2x - 1 = 0$
23. Find all the solutions: $\tan \frac{x}{4} = \frac{\sqrt{3}}{3}$
24. Find all solutions in the interval $[0, 2\pi)$: $\tan^2 \theta \csc \theta = \tan^2 \theta$
25. Evaluate: $\sin 255^\circ$. (use the fact that $255^\circ = 210^\circ + 45^\circ$.)
26. Evaluate: $\tan \frac{13\pi}{12}$. (use the fact that $\frac{13\pi}{12} = \frac{4\pi}{3} - \frac{\pi}{4}$.)
27. Simplify: $\frac{\tan 37^\circ - \tan 13^\circ}{1 + (\tan 37^\circ)(\tan 13^\circ)}$
28. Simplify: $\sin 8x \cos 2x + \cos 8x \sin 2x$
29. Given $\sin u = -\frac{5}{13}$, $0 < u < \frac{3\pi}{2}$ and $\csc v = \frac{\sqrt{10}}{3}$, $\frac{\pi}{2} < v < \pi$, find $\cos(u - v)$.
30. Simplify: $\sin\left(x - \frac{\pi}{6}\right)$
31. Simplify: $\tan\left(\frac{\pi}{4} + \theta\right)$
32. Simplify: $\cos(2x - y) \cos y - \sin(2x - y) \sin y$
33. Simplify: $\sin\left(\frac{4\pi}{3} - x\right) + \cos\left(x + \frac{5\pi}{6}\right)$
34. Find all the solutions in the interval $[0, 2\pi)$: $\cos 2x + \sin x = 0$
35. Find all solutions in the interval $[0, 2\pi)$: $\cos^2 x - \cos 2x = 0$
36. Given $\cos \theta = \frac{3}{4}$ and $\sin \theta < 0$, find $\tan 2\theta$.

Answers:

1. $-\frac{\sqrt{33}}{4}$
2. $\frac{2}{7}$
3. $-\frac{2\sqrt{2}}{3}$
4. $\cos x$
5. $\cos^2 x$
6. $-\cot x$
7. $\csc^4 x$
8. $\sec x$
9. $\sin x - 1$
10. $\sec x - \tan x$
11. Answers Vary
12. Answers Vary
13. Answers Vary
14. Answers Vary
15. Answers Vary
16. Answers Vary
17. Answers Vary
18. $\frac{\pi}{6} + 2\pi n, \frac{11\pi}{6} + 2\pi n$
19. $\frac{7\pi}{6} + 2\pi n, \frac{11\pi}{6} + 2\pi n$
20. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
21. $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$
22. $\frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$
24. $0, \frac{\pi}{2}, \pi$
25. $\frac{-\sqrt{2}-\sqrt{6}}{4}$
26. $2 - \sqrt{3}$
27. $\tan 24^\circ$
28. $\sin 10x$
29. $-\frac{3\sqrt{10}}{130}$
30. $\frac{\sqrt{3}}{2} \sin x - \frac{1}{2} \cos x$
31. $\frac{1+\tan \theta}{1-\tan \theta}$
32. $\cos 2x$
33. $-\sqrt{3} \cos x$
34. $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$
35. $0, \pi$
36. $-3\sqrt{7}$