

Answer Key: Chapter 3 - Trigonometric Simplification

Objective: Solutions are checked for mathematical accuracy. Algebraically equivalent steps are acceptable where expressions are defined.

1. Answer: $\tan x$

Work: Use $\tan x = \frac{\sin x}{\cos x}$.

2. Answer: $\cot x$

Work: Use the quotient identity.

3. Answer: $\cos x$

Work: Reciprocal identity.

4. Answer: $\sin x$

Work: Reciprocal identity.

5. Answer: $\sin x$

Work: $\frac{\sin x}{\cos x} \cos x = \sin x$.

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6. Answer: $\cos x$

Work: $\frac{\cos x}{\sin x} \sin x = \cos x.$

7. Answer: 1

Work: Reciprocal factors cancel.

8. Answer: 1

Work: Reciprocal factors cancel.

9. Answer: $\sin x$

Work: $\frac{\sin/\cos}{1/\cos} = \sin x.$

10. Answer: $\cos x$

Work: $\frac{\cos/\sin}{1/\sin} = \cos x.$

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11. Answer: 1

Work: Pythagorean identity.

12. Answer: $\cos^2 x$

Work: Rearrange $\sin^2 x + \cos^2 x = 1$.

13. Answer: $\sin^2 x$

Work: Rearrange the Pythagorean identity.

14. Answer: 1

Work: Use $1 + \tan^2 x = \sec^2 x$.

15. Answer: 1

Work: Use $1 + \cot^2 x = \csc^2 x$.

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16. Answer: $\sec^2 x$

Work: Pythagorean identity.

17. Answer: $\csc^2 x$

Work: Pythagorean identity.

18. Answer: $\sin x$

Work: $1 - \cos^2 x = \sin^2 x$.

19. Answer: $\cos x$

Work: $1 - \sin^2 x = \cos^2 x$.

20. Answer: $\tan x$

Work: $\sec^2 x - 1 = \tan^2 x$.

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21. Answer: $\cot x$

Work: $\csc^2 x - 1 = \cot^2 x$.

22. Answer: $\sin^2 x$

Work: Difference of squares: $1 - \cos^2 x$.

23. Answer: $\cos^2 x$

Work: Difference of squares: $1 - \sin^2 x$.

24. Answer: $\sec x$

Work: $\frac{\sin}{\cos} \cdot \frac{1}{\sin} = \frac{1}{\cos}$.

25. Answer: $\csc x$

Work: $\frac{\cos}{\sin} \cdot \frac{1}{\cos} = \frac{1}{\sin}$.

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26. Answer: $\tan x$

Work: $\sin x / \cos x = \tan x$.

27. Answer: $\cot x$

Work: $\cos x / \sin x = \cot x$.

28. Answer: $\sec^2 x$

Work: $\tan^2 x + 1 = \sec^2 x$.

29. Answer: $\csc^2 x$

Work: $\cot^2 x + 1 = \csc^2 x$.

30. Answer: 1

Work: Denominator = $\sin^2 x$.

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31. Answer: 1

Work: Denominator = $\cos^2 x$.

32. Answer: $\sin x$

Work: Rewrite in sine and cosine; numerator becomes $\frac{\sin^2 x}{\cos x}$.

33. Answer: $\cos x$

Work: Rewrite in sine and cosine; numerator becomes $\frac{\cos^2 x}{\sin x}$.

34. Answer: 1

Work: $\sec^2 x - \tan^2 x = 1$.

35. Answer: 1

Work: $\csc^2 x - \cot^2 x = 1$.

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36. Answer: $\sec x \csc x$

Work: Combine over $\sin x \cos x$; numerator is 1.

37. Answer: $\sec x \csc x$

Work: $\frac{1/\cos^2}{\sin/\cos} = \frac{1}{\sin \cos}$.

38. Answer: $\sec x \csc x$

Work: $\frac{1/\sin^2}{\cos/\sin} = \frac{1}{\sin \cos}$.

39. Answer: $1 - \cos x$

Work: $\sin^2 x = (1 - \cos x)(1 + \cos x)$.

40. Answer: $1 - \sin x$

Work: $\cos^2 x = (1 - \sin x)(1 + \sin x)$.

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41. Answer: 0

Work: Rationalize the first fraction to get $\frac{1+\cos x}{\sin x}$.

42. Answer: 0

Work: Rationalize the first fraction to get $\frac{1+\sin x}{\cos x}$.

43. Answer: $1 - \cos x$

Work: Factor $1 - \cos^2 x$.

44. Answer: $1 - \sin x$

Work: Factor $1 - \sin^2 x$.

45. Answer: $\sin^2 x$

Work: Rewrite both in sine and cosine.

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46. Answer: $\cos^2 x$

Work: Rewrite both in sine and cosine.

47. Answer: $\sin^2 x$

Work: $\frac{\tan^2 x}{\sec^2 x} = \sin^2 x$.

48. Answer: $\cos^2 x$

Work: $\frac{\cot^2 x}{\csc^2 x} = \cos^2 x$.

49. Answer: $\cos x$

Work: Use $\sin 2x = 2 \sin x \cos x$.

50. Answer: $\sin x$

Work: Use $1 - \cos 2x = 2 \sin^2 x$.