

Chapter 7 Solutions

These answers are to be used to check against your solutions. Your homework should show all of your work, not just the answers!

Section 7.1:

6. Example: $\sin(0^\circ) + \cos(0^\circ) \stackrel{?}{=} \tan(0^\circ)$

$$0 + 1 \stackrel{?}{=} 0$$

$$1 \neq 0$$

7. $\sec^2 x + \csc^2 x \stackrel{?}{=} 1$
 $\sec^2 45^\circ + \csc^2 45^\circ \stackrel{?}{=} 1$
 $(\sqrt{2})^2 + (\sqrt{2})^2 \stackrel{?}{=} 1$
 $2 + 2 \stackrel{?}{=} 1$
 $4 \neq 1$

8. $\frac{3}{2}$

9. $-\frac{2}{\sqrt{5}}$

10. $-\frac{\sqrt{24}}{5}$

11. $\frac{\sqrt{65}}{7}$

12. $\cos\left(\frac{\pi}{3}\right)$

13. $\csc(30^\circ)$

14. $\sec(\theta)$

15. 1

16. $\csc(x)$

17. $F = BIl\sin(\theta)$

25. $\csc(\theta) = \frac{5}{2}$

26. $\cot(\theta) = \frac{4}{\sqrt{3}}$

27. $\cos(\theta) = \frac{15}{4}$

29. $\cot(\theta) = -\frac{\sqrt{2}}{3}$

30. $\tan(\theta) = -\frac{3}{4}$

31. $\tan(\theta) = \frac{1}{\sqrt{8}}$

32. $\cos(\theta) = -\frac{3}{\sqrt{13}}$

38. $\sin(30^\circ)$

39. $-\cos\left(\frac{3\pi}{8}\right)$

40. $-\tan\left(\frac{\pi}{5}\right)$

41. $-\csc\left(\frac{\pi}{3}\right)$

44. $\csc(x)$

45. $\csc(\theta)$

47. 2

48. $\cos(x)$

49. $\cos(x) + \sin(x)$

50. $\sin(\theta)$

51. 1

52. $2\csc(x)$

53. 90°

60. 135°

Section 7.2:

$$13. \tan A \stackrel{?}{=} \frac{\sec A}{\csc A}$$

$$\tan A \stackrel{?}{=} \frac{\frac{1}{\cos A}}{\frac{1}{\sin A}}$$

$$\tan A \stackrel{?}{=} \frac{\sin A}{\cos A}$$

$$\tan A = \tan A$$

$$17. \sec x \csc x \stackrel{?}{=} \tan x + \cot x$$

$$\sec x \csc x \stackrel{?}{=} \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}$$

$$\sec x \csc x \stackrel{?}{=} \frac{\sin x}{\cos x} \cdot \frac{\sin x}{\sin x} + \frac{\cos x}{\sin x} \cdot \frac{\cos x}{\cos x}$$

$$\sec x \csc x \stackrel{?}{=} \frac{\sin^2 x}{\cos x \sin x} + \frac{\cos^2 x}{\sin x \cos x}$$

$$\sec x \csc x \stackrel{?}{=} \frac{\sin^2 x + \cos^2 x}{\cos x \sin x}$$

$$\sec x \csc x \stackrel{?}{=} \frac{1}{\cos x \sin x}$$

$$\sec x \csc x \stackrel{?}{=} \frac{1}{\cos x} \cdot \frac{1}{\sin x}$$

$$\sec x \csc x = \sec x \csc x$$

$$21. \frac{\cos y}{1 - \sin y} \stackrel{?}{=} \frac{1 + \sin y}{\cos y}$$

$$\frac{\cos y}{1 - \sin y} \cdot \frac{1 + \sin y}{1 + \sin y} \stackrel{?}{=} \frac{1 + \sin y}{\cos y}$$

$$\frac{\cos y(1 - \sin y)}{1 - \sin^2 y} \stackrel{?}{=} \frac{1 + \sin y}{\cos y}$$

$$\frac{\cos y(1 + \sin y)}{\cos^2 y} \stackrel{?}{=} \frac{1 + \sin y}{\cos y}$$

$$\frac{1 + \sin y}{\cos y} = \frac{1 + \sin y}{\cos y}$$

$$25. \sin \theta \cos \theta \tan \theta + \cos^2 \theta \stackrel{?}{=} 1$$

$$\sin \theta \cos \theta \frac{\sin \theta}{\cos \theta} + \cos^2 \theta \stackrel{?}{=} 1$$

$$\sin^2 \theta + \cos^2 \theta \stackrel{?}{=} 1$$

$$1 = 1$$

$$30. \tan(x) = 2$$

$$32. \sin(x) = \frac{1}{2}$$

$$15. \sec x - \tan x = \frac{1 - \sin x}{\cos x}$$

$$\sec x - \tan x \stackrel{?}{=} \frac{1}{\cos x} - \frac{\sin x}{\cos x}$$

$$\sec x - \tan x = \sec x - \tan x$$

$$19. (\sin A + \cos A)^2 \stackrel{?}{=} \frac{2 + \sec A \csc A}{\sec A \csc A}$$

$$(\sin A + \cos A)^2 \stackrel{?}{=} \frac{2}{\sec A \csc A} + \frac{\sec A \csc A}{\sec A \csc A}$$

$$(\sin A + \cos A)^2 \stackrel{?}{=} 2 \frac{1}{\sec A} \cdot \frac{1}{\csc A} + 1$$

$$(\sin A + \cos A)^2 \stackrel{?}{=} 2 \cos A \sin A + 1$$

$$(\sin A + \cos A)^2 \stackrel{?}{=} 2 \cos A \sin A + \sin^2 A + \cos^2 A$$

$$(\sin A + \cos A)^2 = (\sin A + \cos A)^2$$

$$23. \csc x - 1 \stackrel{?}{=} \frac{\cot^2 x}{\csc x + 1}$$

$$\csc x - 1 \stackrel{?}{=} \frac{\csc^2 x - 1}{\csc x + 1}$$

$$\csc x - 1 \stackrel{?}{=} \frac{(\csc x + 1)(\csc x - 1)}{\csc x + 1}$$

$$\csc x - 1 = \csc x - 1$$

$$29. \sec(x) = \sqrt{2}$$

$$31. \cos(x) = 0$$

$$33. \sin(x) = 1$$

Section 7.3:

$$15. \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$17. \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$19. \frac{\sqrt{2}+\sqrt{6}}{4}$$

$$21. \frac{-4+2\sqrt{3}}{2}$$

$$23. \sqrt{2} - \sqrt{6}$$

$$25. 2 - \sqrt{3}$$

$$27. \frac{24}{25}$$

$$29. \frac{12\sqrt{17}-5\sqrt{34}}{102}$$

$$31. \frac{65}{56}$$

$$34. \begin{aligned} \cos\left(\frac{\pi}{2} + x\right) &\stackrel{?}{=} -\sin x \\ \cos\frac{\pi}{2} \cos x - \sin\frac{\pi}{2} \sin x &\stackrel{?}{=} -\sin x \\ 0 \cdot \cos x - 1 \cdot \sin x &\stackrel{?}{=} -\sin x \\ -\sin x &= -\sin x \end{aligned}$$

$$35. \begin{aligned} \cos 60^\circ \cos A - \sin 60^\circ \sin A &\stackrel{?}{=} \sin 30^\circ \cos A - \\ &\quad \cos 30^\circ \sin A \\ \frac{1}{2} \cos A - \frac{\sqrt{3}}{2} \sin A &= \frac{1}{2} \cos A - \frac{\sqrt{3}}{2} \sin A \end{aligned}$$

$$36. \begin{aligned} \sin A \cos \pi + \cos A \sin \pi &\stackrel{?}{=} -\sin A \\ (\sin A)(-1) + (\cos A)(0) &\stackrel{?}{=} -\sin A \\ -\sin A &= -\sin A \end{aligned}$$

$$37. \begin{aligned} \cos 180^\circ \cos x - \sin 180^\circ \sin x &\stackrel{?}{=} -\cos x \\ -1 \cdot \cos x - 0 \cdot \sin x &\stackrel{?}{=} -\cos x \\ -\cos x &= -\cos x \end{aligned}$$

$$38. \tan(x + 45^\circ) \stackrel{?}{=} \frac{1 + \tan x}{1 - \tan x}$$

$$49. \begin{aligned} \frac{\tan x + \tan 45^\circ}{1 - \tan x \tan 45^\circ} &\stackrel{?}{=} \frac{1 + \tan x}{1 - \tan x} \\ \frac{\tan x + 1}{1 - (\tan x)(1)} &\stackrel{?}{=} \frac{1 + \tan x}{1 - \tan x} \\ \frac{1 + \tan x}{1 - \tan x} &= \frac{1 + \tan x}{1 - \tan x} \end{aligned}$$

$$49. \begin{aligned} \sec^2 x &\stackrel{?}{=} \frac{1 - \cos^2 x}{1 - \sin^2 x} + \csc^2 x - \cot^2 x \\ \sec^2 x &\stackrel{?}{=} \frac{1 - \cos^2 x}{\cos^2 x} + 1 + \cot^2 x - \cot^2 x \\ \sec^2 x &\stackrel{?}{=} \frac{1}{\cos^2 x} - \frac{\cos^2 x}{\cos^2 x} + 1 \\ \sec^2 x &\stackrel{?}{=} \sec^2 x - 1 + 1 \\ \sec^2 x &= \sec^2 x \end{aligned}$$

$$51. \frac{\sqrt{3}}{2}$$

$$54. 8; 360^\circ; 30^\circ$$

Section 7.4:

$$14. \sqrt{\frac{2+\sqrt{3}}{2}}$$

$$15. \sqrt{\frac{2+\sqrt{3}}{2}}$$

$$16. 2 + \sqrt{3}$$

$$17. \sqrt{\frac{\sqrt{2}+\sqrt{2}}{2}}$$

$$18. -\sqrt{\frac{2-\sqrt{3}}{4}}$$

$$19. \sqrt{2} - 1$$

$$20. \frac{\sqrt{15}}{5}$$

$$21. \frac{24}{25}; \frac{7}{25}; \frac{24}{7}$$

$$22. \frac{\sqrt{32}}{9}; \frac{7}{9}; \frac{\sqrt{32}}{7}$$

$$23. -\frac{4}{5}; -\frac{3}{5}; \frac{4}{3}$$

$$24. -\frac{\sqrt{63}}{8}; \frac{1}{8}; -\sqrt{63}$$

$$28. \begin{aligned} \csc 2\theta &\stackrel{?}{=} \frac{1}{2} \sec \theta \csc \theta \\ \frac{1}{\sin 2\theta} &\stackrel{?}{=} \frac{1}{2} \sec \theta \csc \theta \\ \frac{1}{2 \sin \theta \cos \theta} &\stackrel{?}{=} \frac{1}{2} \sec \theta \csc \theta \\ \frac{1}{2} \cdot \frac{1}{\sin \theta} \cdot \frac{1}{\cos \theta} &\stackrel{?}{=} \frac{1}{2} \sec \theta \csc \theta \\ \frac{1}{2} \csc \theta \sec \theta &\stackrel{?}{=} \frac{1}{2} \sec \theta \csc \theta \\ \frac{1}{2} \sec \theta \csc \theta &= \frac{1}{2} \sec \theta \csc \theta \end{aligned}$$

$$29. \cos A - \sin A \stackrel{?}{=} \frac{\cos 2A}{\cos A + \sin A}$$

$$30. \cos A - \sin A \stackrel{?}{=} \frac{\cos^2 A - \sin^2 A}{\cos A + \sin A}$$

$$\cos A - \sin A \stackrel{?}{=} \frac{(\cos A - \sin A)(\cos A + \sin A)}{\cos A + \sin A}$$

$$31. \cos A - \sin A = \cos A - \sin A$$

$$30. \begin{aligned} \sin^2 \theta + 2 \sin \theta \cos \theta + \cos^2 \theta - 1 &\stackrel{?}{=} \sin 2\theta \\ \frac{(\sin \theta + \cos \theta)^2 - 1}{2 \sin \theta \cos \theta + 1 - 1} &\stackrel{?}{=} \frac{\sin 2\theta}{2 \sin \theta \cos \theta} \\ \sin 2\theta &= \sin 2\theta \end{aligned}$$

$$31. \begin{aligned} \cos x - 1 &\stackrel{?}{=} \frac{\cos 2x - 1}{2(\cos x + 1)} \\ \cos x - 1 &\stackrel{?}{=} \frac{2 \cos^2 x - 1 - 1}{2(\cos x + 1)} \\ \cos x - 1 &\stackrel{?}{=} \frac{2 \cos^2 x - 2}{2(\cos x + 1)} \\ \cos x - 1 &\stackrel{?}{=} \frac{2(\cos^2 x - 1)}{2(\cos x + 1)} \\ \cos x - 1 &\stackrel{?}{=} \frac{2(\cos x - 1)(\cos x + 1)}{2(\cos x + 1)} \\ \cos x - 1 &= \cos x - 1 \end{aligned}$$

$$32. \begin{aligned} \sec 2\theta &\stackrel{?}{=} \frac{\cos^2 \theta + \sin^2 \theta}{\cos^2 \theta - \sin^2 \theta} \\ \sec 2\theta &\stackrel{?}{=} \frac{1}{\cos 2\theta} \\ \sec 2\theta &= \sec 2\theta \end{aligned}$$

$$41. \sqrt{6} - \sqrt{2}$$

42. Student should show work using a value of radian.

Section 7.5:

17. 45°

18. 120°

19. 45°

20. $30^\circ; -60^\circ$

21. $90^\circ; 0^\circ$

22. 90°

23. $135^\circ; 225^\circ$

24. $30^\circ; 150^\circ$

25. $0^\circ; 180^\circ; 45^\circ; 225^\circ$

26. $60^\circ; 300^\circ$

27. $0^\circ; 180^\circ; 120^\circ; 240^\circ$

30. $\frac{5\pi}{6}; \frac{5\pi}{4}; \frac{7\pi}{4}$

31. $\frac{7\pi}{6}; \frac{11\pi}{6}$

32. $\frac{\pi}{4}; \frac{7\pi}{4}; 0; \pi$

33. $0; \pi; \frac{11\pi}{6}$

37. $\frac{7\pi}{6} + 2\pi k; \frac{11\pi}{6} + 2\pi k$

38. $\frac{\pi}{6} + 2\pi k; \frac{5\pi}{6} + 2\pi k; \frac{3\pi}{2} + 2\pi k$

39. $\pi k; \frac{\pi}{6} + \pi k$

40. $\frac{\pi}{6} + 2\pi k; \frac{5\pi}{6} + 2\pi k$

41. πk

42. $\frac{\pi}{3} + 2\pi k; \frac{5\pi}{3} + 2\pi k$

63. Sample answer: $\sin(x) = \frac{\sqrt{2}}{5}$