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Indicate the answer choice that best completes the statement or answers the question.

1. Which of the following are the solutions of $\cot^2 x - \csc x = 1$ on the interval [0, 2π)?

a. $\frac{5\pi}{6}$ b. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

c. $\frac{\pi}{6}, \frac{5\pi}{6}$ d. $\frac{5\pi}{6}, \frac{3\pi}{2}$

2. An alternating current *i* in amperes in another circuit can be found after *t* seconds using $i = 4\sin(195°t)$. Rewrite the formula in terms of the difference of two angle measures.

a. $4\sin(30°t - 225°t)$ b. $\frac{1}{4}\sin(225°t - 30°t)$

c. $\frac{1}{4}\sin(30°t - 225°t)$ d. $4\sin(225°t - 30°t)$

3. Simplify $\frac{\tan^2 x - 1}{1 - \sec^2 x}$.

a. $\cot^2 x + 1$ b. $\cot^2 x - 1$

c. $1 - \cot^2 x$ d. cannot be simplified

4. If $\sin\theta = \frac{4}{5}$ and θ terminates on the interval $\left[0, \frac{\pi}{2}\right]$, find the exact value of tan 2θ.

a. $\frac{3}{4}$

b. $-\frac{7}{24}$

c. $\frac{4}{3}$

d. $-\frac{24}{7}$

5. If tan θ = 2.8, find $\cot\left(\theta - \frac{\pi}{2}\right)$.

a. –2.8 b. 0.36

c. 2.8 d. –0.36

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6. Rewrite $\sin 8x \sin 10x \cos 8x \cos 10x \sin 8x \cos 10x \cos 8x \sin 10x$ as a sum or difference.

a. $\frac{1}{2}\left[\cos(-2x) - \cos(18x)\right]$ b. $\frac{1}{2}\left[\cos(-2x) + \cos(18x)\right]$

c. $\frac{1}{2}\left[\cos(18x) + \cos(18x)\right]$ d. $\frac{1}{2}\left[\cos(-2x) + \sin(18x)\right]$

7. Solve $7 - 6\sin x = 3 + 2\sin x$ for $0° \le x \le 180°$.

a. 120° b. 180°

c. 135° d. 150° or 30°

8. Use a half-angle identity to find the exact value of $\cos 22.5°$.

a. $\frac{\sqrt{2-\sqrt{2}}}{2}$ b. $\frac{\sqrt{2+\sqrt{2}}}{2}$

c. $\frac{\sqrt{2+\sqrt{3}}}{2}$ d. $\frac{\sqrt{2-\sqrt{3}}}{2}$

9. Find the exact value of $\sin\frac{13\pi}{12} + \sin\frac{5\pi}{12}$.

a. $-\frac{\sqrt{2}}{2}$ b. $-\frac{\sqrt{6}}{2}$

c. $\frac{\sqrt{6}}{2}$ d. $\frac{\sqrt{2}}{2}$

10. Simplify $\frac{1}{\csc x + 1} + \frac{1}{\csc x - 1}$.

a. $2\cos x \sec^2 x$ b. $-2\tan^2 x$

c. $-2\cot^2 x$ d. $2\sin x \sec^2 x$

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11. Verify which of the following are trigonometric identities.

1) $2\dfrac{\cot^2\theta}{\csc\theta}\sec^2\theta = 4\tan\theta\cos\theta\csc^2\theta$

2) $4\dfrac{\cot^2\theta}{\csc\theta}\sec^2\theta = 4\tan\theta\cos\theta\csc^2\theta$

a. Only the second equation is an identity.
b. Only the first equation is an identity.
c. None of the equations are identities.
d. Both the equations are identities.

12. Which sum or difference identity can be used to verify $\csc\csc\left(\dfrac{\pi}{2}-\theta\right) = \sec\theta$?

a. $\sin(a-b) = \sin a\cos b - \cos a\sin b$
b. $\sin(a-b) = \sin a\sin b - \cos a\cos b$
c. $\tan(a-b) = \dfrac{\tan a - \tan b}{1+\tan a\tan b}$
d. $\csc(a-b) = \csc a\sec b - \sec a\csc b$

13. Solve $2\tan\dfrac{x}{2} + 2\tan\dfrac{x}{2} = \sqrt{3}$ on the interval $[0, 2\pi)$.

a. $\dfrac{\sqrt{3}}{4}$
b. $\dfrac{\pi}{3}$
c. $\dfrac{\pi}{3}, \dfrac{2\pi}{3}$
d. $\dfrac{\sqrt{3}}{2}$

14. What basic trigonometric identity would you use to verify that $\dfrac{\sin^2 x + \cos^2 x}{\cos x} = \sec x$?

a. $\sin x = \dfrac{1}{\csc x}$
b. $1 + \cot^2 x = \csc^2 x$
c. $\cos^2 x + \sin^2 x = 1$
d. $\cos x = \dfrac{1}{\sec x}$

15. Simplify $\dfrac{\cos x}{\csc x + 1}$

a. $\tan x - \tan x\csc x$
b. $\sin x\cos x + \cos x$
c. $\tan x - \tan x\sec x$
d. $\tan x + \tan x\sec x$

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16. Simplify $(\cos x - \sin x)(\cos x + \sin x)$

a. $\sin^2 x \cos^2 x$ b. $2\cos^2 x + 1$

c. $2\cos^2 x - 1$ d. 0

17. $\cos 2x + \frac{1}{2} = 0$

a. $\frac{\pi}{6} + 2\pi n; \frac{\pi}{3} + 2\pi n$ b. $\frac{\pi}{3} + 2\pi n; \frac{2\pi}{3} + 2\pi n$

c. $\frac{\pi}{3} + \pi n; \frac{2\pi}{3} + \pi n$ d. $\frac{\pi}{6} + \pi n; \frac{\pi}{3} + \pi n$

18. Find the exact value of $\frac{\tan 155 + \tan(-95)}{1 - \tan 155 \tan(-95)}$.

a. $-\sqrt{3}$ b. $-\frac{\sqrt{3}}{3}$

c. $\frac{\sqrt{3}}{3}$ d. $\sqrt{3}$

19. Which of the following are the solutions of $\cot^2 x + 2\csc x = -2$on the interval [0, 2π)?

a. $\frac{3\pi}{2}, \frac{\pi}{2}$ b. π

c. $\frac{\pi}{2}$ d. $\frac{3\pi}{2}$

20. Solve $\sin 2\theta = \cos\theta$on the interval [0, 2π).

a. $\frac{3\pi}{2}, \frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$ b. $\frac{\pi}{2}, \frac{\pi}{6}$

c. $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$ d. $\frac{3\pi}{2}, \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

21. $\cos x \tan x - \cos x = 0$

a. $0 + n\pi, \frac{5\pi}{4} + 2n\pi$ b. $0 + n\pi, \frac{\pi}{4} + 2n\pi$

c. $\frac{\pi}{2} + n\pi, \frac{5\pi}{4} + 2n\pi$ d. $\frac{\pi}{2} + n\pi, \frac{\pi}{4} + 2n\pi$

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22. If cot $\theta = 3.8$, find $\tan\left(\theta - \frac{\pi}{2}\right)$.

a. 0.26 b. –0.26
c. 3.8 d. –3.8

Find all solutions of each equation on the interval [0, 360).

23. $\csc x + 1 = \cot x$

a. $0, \pi$ b. π
c. $\frac{3\pi}{2}$ d. $\frac{\pi}{2}, \frac{3\pi}{2}$

24. Simplify $\frac{\sin^2 x - 1}{1 - \sin^2 x}$.

a. $\tan^2 x + \sec^2 x$ b. $\tan^2 x - \sec^2 x$
c. $\sec^2 x - \tan^2 x$ d. cannot be simplified

25. Find the exact value of $\frac{\tan 115 + \tan(-70)}{1 - \tan 115 \tan(-70)}$.

a. no solution b. 0
c. -1 d. 1

26. Solve $2\tan\frac{x}{2} + 2\tan\frac{x}{2} = \sqrt{2}$ on the interval [0, 2π).

a. $\frac{\pi}{4}, \frac{3\pi}{4}$ b. $\frac{\sqrt{2}}{2}$
c. $\frac{\pi}{6}, \frac{5\pi}{6}$ d. $\frac{\sqrt{2}}{4}$

27. Simplify $\frac{1}{\cos x + 1} + \frac{1}{\cos x - 1}$.

a. $-2\cot x \csc x$ b. $2\sec^2 x$
c. $2\csc^2 x$ d. $-2\tan x \sec x$

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28. $\sin\frac{x}{2}+\frac{\sqrt{3}}{2}=0$

a. $\frac{8\pi}{3}+2\pi n;\frac{10\pi}{3}+2\pi n$ b. $\frac{4\pi}{3}+2\pi n;\frac{5\pi}{3}+2\pi n$

c. $\frac{4\pi}{3}+4\pi n;\frac{5\pi}{3}+4\pi n$ d. $\frac{8\pi}{3}+4\pi n;\frac{10\pi}{3}+4\pi n$

29. Simplify $\frac{\sin x}{\sec x-1}$

a. $\cot x+\cot x\sin x$ b. $\cot x+\cot x\cos x$

c. $\sin x\cos x+\sin x$ d. $\cot x-\cot x\cos x$

30. Find the exact value of $\cos\frac{13\pi}{12}+\cos\frac{5\pi}{12}$.

a. $\frac{\sqrt{6}}{2}$ b. $-\frac{\sqrt{2}}{2}$

c. $-\frac{\sqrt{6}}{2}$ d. $\frac{\sqrt{2}}{2}$

31. Which of the following expressions is equal to $1 - \cos^4\theta$?

a. $2\sin^2\theta - \sin^4\theta$ b. $\sin^2\theta - \sin^4\theta$

c. $-2\sin^2\theta - \sin^4\theta$ d. $2\sin^2\theta + \sin^4\theta$

32. $\cot x\sin x+\cot x=0$

a. $0+n\pi,\frac{3\pi}{2}+2n\pi$ b. $0+n\pi,\frac{\pi}{2}+2n\pi$

c. $\frac{\pi}{2}+n\pi,\frac{\pi}{2}+2n\pi$ d. $\frac{\pi}{2}+n\pi,\frac{3\pi}{2}+2n\pi$

33. Write $\cos(\arcsin 3x+\arccos x)$as an algebraic expression of x that does not involve trigonometric functions.

a. $x\sqrt{1-9x^2}-3x\sqrt{1-x^2}$ b. $3x\sqrt{1-x^2}-x\sqrt{1-9x^2}$

c. $x\sqrt{1-3x^2}-x\sqrt{1-x^2}$ d. $-4x\sqrt{1-x^2}$

34. $\sin\frac{x}{2}+\frac{1}{2}=0$

a. $\frac{7\pi}{3}+2\pi n;\frac{11\pi}{3}+2\pi n$ b. $\frac{7\pi}{3}+4\pi n;\frac{11\pi}{3}+4\pi n$

c. $\frac{7\pi}{6}+4\pi n;\frac{11\pi}{6}+4\pi n$ d. $\frac{7\pi}{6}+2\pi n;\frac{11\pi}{6}+2\pi n$

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35. Simplify $(\tan\theta - \sec\theta)^2$.

a. $\dfrac{\sin\theta - 1}{1 + \sin\theta}$ b. $\dfrac{1 - \sin\theta}{1 + \sin\theta}$

c. $\tan^2\theta - \sec^2\theta$ d. $\sec^2\theta - \tan^2\theta$

36. If $\sin\theta = \dfrac{2}{5}$ and $\sec\theta < 0$, find $\cos\theta$ and $\tan\theta$.

a. $\cos\theta = \dfrac{\sqrt{21}}{5}, \tan\theta = \dfrac{2\sqrt{21}}{21}$ b. $\sec\theta = 2\sqrt{5}, \tan\theta = \dfrac{21}{5}$

c. $\cos\theta = \dfrac{21}{5}, \tan\theta = \dfrac{5}{21}$ d. $\cos\theta = 2, \tan\theta = \dfrac{2\sqrt{21}}{5}$

37. Use a half-angle identity to find the exact value of $\tan 22.5°$.

a. $\sqrt{3 - 2\sqrt{2}}$ b. $\sqrt{3 + 2\sqrt{3}}$

c. $\sqrt{3 + 2\sqrt{2}}$ d. $\sqrt{3 - 2\sqrt{3}}$

38. $\sin 2x + \dfrac{\sqrt{3}}{2} = 0$

a. $\dfrac{\pi}{3} + \pi n; \dfrac{5\pi}{3} + \pi n$ b. $\dfrac{\pi}{3} + 2\pi n; \dfrac{5\pi}{3} + 2\pi n$

c. $\dfrac{2\pi}{3} + \pi n; \dfrac{5\pi}{6} + \pi n$ d. $\dfrac{2\pi}{3} + 2\pi n; \dfrac{5\pi}{6} + 2\pi n$

39. Solve $\sin 2\theta = \sqrt{2}\sin\theta$ on the interval $[0, 2\pi)$.

a. $0, \pi, \dfrac{\pi}{4}$ b. $0, \pi, \dfrac{\pi}{4}, \dfrac{7\pi}{4}$

c. $0, \pi, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}$ d. $\dfrac{3\pi}{2}, \dfrac{\pi}{2}, \dfrac{\pi}{4}, \dfrac{3\pi}{4}$

40. Solve $4 + 2\sin x = 14 - 8\sin x$ for $0° \le x \le 180°$.

a. 0° b. 60°

c. 90° d. 45°

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41. Rewrite $\cos 9x \cos 4x$ as a sum or difference.

a. $\frac{1}{2}\left[\cos(5x) + \cos(13x)\right]$ b. $\frac{1}{2}\left[\cos(13x) + \cos(13x)\right]$

c. $\frac{1}{2}\left[\cos(5x) + \sin(13x)\right]$ d. $\frac{1}{2}\left[\cos(5x) - \cos(13x)\right]$

42. Find the exact value of $\cos 75°$.

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

b. $\frac{\sqrt{2}}{2}$

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

d. $\frac{\sqrt{6}}{4}$

Find all solutions of each equation on the interval [0, 360).

43. $\tan x + 1 = \sec x$

a. π b. $\frac{3\pi}{2}$

c. $0, \pi$ d. $\frac{\pi}{2}, \frac{3\pi}{2}$

44. Use a half-angle identity to find the exact value of $\cos 67.5°$.

a. $\frac{\sqrt{2 + \sqrt{2}}}{2}$ b. $\frac{\sqrt{2 + \sqrt{3}}}{2}$

c. $\frac{\sqrt{2 - \sqrt{2}}}{2}$ d. $\frac{\sqrt{2 - \sqrt{3}}}{2}$

45. Which sum or difference identity can be used to verify $\sin\left(\frac{\pi}{2} + x\right) = \cos x$?

a. $\sin(a + b) = \sin a \sin b + \cos a \cos b$ b. $\sin(a + b) = \sin a \sin b - \cos a \cos b$

c. $\sin(a + b) = \sin a \cos b - \cos a \sin b$ d. $\sin(a + b) = \sin a \cos b + \cos a \sin b$

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46. If sec $\theta = -7.3$, find $\sin\left(\theta - \frac{\pi}{2}\right)$.

a. –0.14 b. 7.3
c. 0.14 d. –7.3

47. If $\sin\theta = \frac{2}{3}$ and $\sec\theta < 0$, find $\cos\theta$ and $\tan\theta$.

a. $\cos\theta = 2, \tan\theta = \frac{2\sqrt{5}}{3}$ b. $\cos\theta = \frac{-\sqrt{5}}{3}, \tan\theta = \frac{-2\sqrt{5}}{5}$
c. $\sec\theta = 2\sqrt{3}, \tan\theta = \frac{5}{3}$ d. $\cos\theta = \frac{5}{3}, \tan\theta = \frac{3}{5}$

48. Simplify $(\csc\theta - \cot\theta)^2$.

a. $\frac{\cos\theta - 1}{1 + \cos\theta}$ b. $\frac{1 - \cos\theta}{1 + \cos\theta}$
c. $\cot^2\theta - \csc^2\theta$ d. $\csc^2\theta - \cot^2\theta$

49. Simplify $(\cot x - \csc x)(\cot x + \csc x)$

a. -1 b. 1
c. 0 d. $\csc^2 x \cot^2 x$

50. Simplify $(\tan x - \sec x)(\tan x + \sec x)$

a. -1 b. 1
c. 0 d. $\sec^2 x \tan^2 x$

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Answer Key

1. b

2. d

3. b

4. d

5. a

6. d

7. d

8. b

9. d

10. d

11. a

12. a

13. c

14. c

15. c

16. c

17. c

18. d

19. d

20. a

21. d

22. d

23. c

24. b

25. d

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26. a

27. a

28. d

29. b

30. a

31. a

32. d

33. a

34. b

35. a

36. a

37. a

38. c

39. b

40. c

41. a

42. a

43. c

44. c

45. d

46. c

47. b

48. b

49. a

50. a