

Worksheet 19 - Trigonometric Equations (§7.5)

In Exercises 1 - 18, compute all of the exact solutions of the equation and then list those solutions which are in the interval $[0, 2\pi)$.

1. $\sin(5x) = 0$

2. $\cos(3x) = \frac{1}{2}$

3. $\sin(-2x) = \frac{\sqrt{3}}{2}$

4. $\tan(6x) = 1$

5. $\csc(4x) = -1$

6. $\sec(3x) = \sqrt{2}$

7. $\cot(2x) = -\frac{\sqrt{3}}{3}$

8. $\cos(9x) = 9$

9. $\sin\left(\frac{x}{3}\right) = \frac{\sqrt{2}}{2}$

10. $\cos\left(x + \frac{5\pi}{6}\right) = 0$

11. $\sin\left(2x - \frac{\pi}{3}\right) = -\frac{1}{2}$

12. $2\cos\left(x + \frac{7\pi}{4}\right) = \sqrt{3}$

13. $\csc(x) = 0$

14. $\tan(2x - \pi) = 1$

15. $\tan^2(x) = 3$

16. $\sec^2(x) = \frac{4}{3}$

17. $\cos^2(x) = \frac{1}{2}$

18. $\sin^2(x) = \frac{3}{4}$

In Exercises 19 - 42, solve the equation, giving the exact solutions which lie in $[0, 2\pi)$

19. $\sin(x) = \cos(x)$

20. $\sin(2x) = \sin(x)$

21. $\sin(2x) = \cos(x)$

22. $\cos(2x) = \sin(x)$

23. $\cos(2x) = \cos(x)$

24. $\cos(2x) = 2 - 5\cos(x)$

25. $3\cos(2x) + \cos(x) + 2 = 0$

26. $\cos(2x) = 5\sin(x) - 2$

27. $3\cos(2x) = \sin(x) + 2$

28. $2\sec^2(x) = 3 - \tan(x)$

29. $\tan^2(x) = 1 - \sec(x)$

30. $\cot^2(x) = 3\csc(x) - 3$

31. $\sec(x) = 2\csc(x)$

32. $\cos(x)\csc(x)\cot(x) = 6 - \cot^2(x)$

33. $\sin(2x) = \tan(x)$

34. $\cot^4(x) = 4\csc^2(x) - 7$

35. $\cos(2x) + \csc^2(x) = 0$

36. $\tan^3(x) = 3\tan(x)$

37. $\tan^2(x) = \frac{3}{2}\sec(x)$

38. $\cos^3(x) = -\cos(x)$

39. $\tan(2x) - 2\cos(x) = 0$

40. $\csc^3(x) + \csc^2(x) = 4\csc(x) + 4$

41. $2\tan(x) = 1 - \tan^2(x)$

42. $\tan(x) = \sec(x)$

In Exercises 43 - 58, solve the equation, giving the exact solutions which lie in $[0, 2\pi)$

43. $\sin(6x) \cos(x) = -\cos(6x) \sin(x)$

44. $\sin(3x) \cos(x) = \cos(3x) \sin(x)$

45. $\cos(2x) \cos(x) + \sin(2x) \sin(x) = 1$

46. $\cos(5x) \cos(3x) - \sin(5x) \sin(3x) = \frac{\sqrt{3}}{2}$

47. $\sin(x) + \cos(x) = 1$

48. $\sin(x) + \sqrt{3} \cos(x) = 1$

49. $\sqrt{2} \cos(x) - \sqrt{2} \sin(x) = 1$

50. $\sqrt{3} \sin(2x) + \cos(2x) = 1$

51. $\cos(2x) - \sqrt{3} \sin(2x) = \sqrt{2}$

52. $3\sqrt{3} \sin(3x) - 3 \cos(3x) = 3\sqrt{3}$

53. $\cos(3x) = \cos(5x)$

54. $\cos(4x) = \cos(2x)$

55. $\sin(5x) = \sin(3x)$

56. $\cos(5x) = -\cos(2x)$

57. $\sin(6x) + \sin(x) = 0$

58. $\tan(x) = \cos(x)$

In Exercises 59 - 68, solve the equation.

59. $\arccos(2x) = \pi$

60. $\pi - 2 \arcsin(x) = 2\pi$

61. $4 \arctan(3x - 1) - \pi = 0$

62. $6 \operatorname{arccot}(2x) - 5\pi = 0$

63. $4 \operatorname{arcsec}\left(\frac{x}{2}\right) = \pi$

64. $12 \operatorname{arccsc}\left(\frac{x}{3}\right) = 2\pi$

65. $9 \arcsin^2(x) - \pi^2 = 0$

66. $9 \operatorname{arccos}^2(x) - \pi^2 = 0$

67. $8 \operatorname{arccot}^2(x) + 3\pi^2 = 10\pi \operatorname{arccot}(x)$

68. $6 \arctan(x)^2 = \pi \arctan(x) + \pi^2$

In Exercises 69 - 80, solve the inequality. Express the exact answer in interval notation, restricting your attention to $0 \leq x \leq 2\pi$.

69. $\sin(x) \leq 0$

70. $\tan(x) \geq \sqrt{3}$

71. $\sec^2(x) \leq 4$

72. $\cos^2(x) > \frac{1}{2}$

73. $\cos(2x) \leq 0$

74. $\sin\left(x + \frac{\pi}{3}\right) > \frac{1}{2}$

75. $\cot^2(x) \geq \frac{1}{3}$

76. $2 \cos(x) \geq 1$

77. $\sin(5x) \geq 5$

78. $\cos(3x) \leq 1$

79. $\sec(x) \leq \sqrt{2}$

80. $\cot(x) \leq 4$