

Worksheet 16 KEY - The Six Trigonometric Functions (§6.6 and §7.1)

1. $\tan\left(\frac{\pi}{4}\right) = 1$
2. $\sec\left(\frac{\pi}{6}\right) = \frac{2\sqrt{3}}{3}$
3. $\csc\left(\frac{5\pi}{6}\right) = 2$
4. $\cot\left(\frac{4\pi}{3}\right) = \frac{\sqrt{3}}{3}$
5. $\tan\left(-\frac{11\pi}{6}\right) = \frac{\sqrt{3}}{3}$
6. $\sec\left(-\frac{3\pi}{2}\right)$ is undefined
7. $\csc\left(-\frac{\pi}{3}\right) = -\frac{2\sqrt{3}}{3}$
8. $\cot\left(\frac{13\pi}{2}\right) = 0$
9. $\tan(117\pi) = 0$
10. $\sec\left(-\frac{5\pi}{3}\right) = 2$
11. $\csc(3\pi)$ is undefined
12. $\cot(-5\pi)$ is undefined
13. $\tan\left(\frac{31\pi}{2}\right)$ is undefined
14. $\sec\left(\frac{\pi}{4}\right) = \sqrt{2}$
15. $\csc\left(-\frac{7\pi}{4}\right) = \sqrt{2}$
16. $\cot\left(\frac{7\pi}{6}\right) = \sqrt{3}$
17. $\tan\left(\frac{2\pi}{3}\right) = -\sqrt{3}$
18. $\sec(-7\pi) = -1$
19. $\csc\left(\frac{\pi}{2}\right) = 1$
20. $\cot\left(\frac{3\pi}{4}\right) = -1$
21. $\sin(\theta) = \frac{3}{5}, \cos(\theta) = -\frac{4}{5}, \tan(\theta) = -\frac{3}{4}, \csc(\theta) = \frac{5}{3}, \sec(\theta) = -\frac{5}{4}, \cot(\theta) = -\frac{4}{3}$
22. $\sin(\theta) = -\frac{12}{13}, \cos(\theta) = -\frac{5}{13}, \tan(\theta) = \frac{12}{5}, \csc(\theta) = -\frac{13}{12}, \sec(\theta) = -\frac{13}{5}, \cot(\theta) = \frac{5}{12}$
23. $\sin(\theta) = \frac{24}{25}, \cos(\theta) = \frac{7}{25}, \tan(\theta) = \frac{24}{7}, \csc(\theta) = \frac{25}{24}, \sec(\theta) = \frac{25}{7}, \cot(\theta) = \frac{7}{24}$
24. $\sin(\theta) = -\frac{4\sqrt{3}}{7}, \cos(\theta) = \frac{1}{7}, \tan(\theta) = -4\sqrt{3}, \csc(\theta) = -\frac{7\sqrt{3}}{12}, \sec(\theta) = 7, \cot(\theta) = -\frac{\sqrt{3}}{12}$
25. $\sin(\theta) = -\frac{\sqrt{91}}{10}, \cos(\theta) = -\frac{3}{10}, \tan(\theta) = \frac{\sqrt{91}}{3}, \csc(\theta) = -\frac{10\sqrt{91}}{91}, \sec(\theta) = -\frac{10}{3}, \cot(\theta) = \frac{3\sqrt{91}}{91}$
26. $\sin(\theta) = \frac{\sqrt{530}}{530}, \cos(\theta) = -\frac{23\sqrt{530}}{530}, \tan(\theta) = -\frac{1}{23}, \csc(\theta) = \sqrt{530}, \sec(\theta) = -\frac{\sqrt{530}}{23}, \cot(\theta) = -23$
27. $\sin(\theta) = -\frac{2\sqrt{5}}{5}, \cos(\theta) = \frac{\sqrt{5}}{5}, \tan(\theta) = -2, \csc(\theta) = -\frac{\sqrt{5}}{2}, \sec(\theta) = \sqrt{5}, \cot(\theta) = -\frac{1}{2}$
28. $\sin(\theta) = \frac{\sqrt{15}}{4}, \cos(\theta) = -\frac{1}{4}, \tan(\theta) = -\sqrt{15}, \csc(\theta) = \frac{4\sqrt{15}}{15}, \sec(\theta) = -4, \cot(\theta) = -\frac{\sqrt{15}}{15}$
29. $\sin(\theta) = -\frac{\sqrt{6}}{6}, \cos(\theta) = -\frac{\sqrt{30}}{6}, \tan(\theta) = \frac{\sqrt{5}}{5}, \csc(\theta) = -\sqrt{6}, \sec(\theta) = -\frac{\sqrt{30}}{5}, \cot(\theta) = \sqrt{5}$
30. $\sin(\theta) = \frac{2\sqrt{2}}{3}, \cos(\theta) = \frac{1}{3}, \tan(\theta) = 2\sqrt{2}, \csc(\theta) = \frac{3\sqrt{2}}{4}, \sec(\theta) = 3, \cot(\theta) = \frac{\sqrt{2}}{4}$
31. $\sin(\theta) = \frac{\sqrt{5}}{5}, \cos(\theta) = \frac{2\sqrt{5}}{5}, \tan(\theta) = \frac{1}{2}, \csc(\theta) = \sqrt{5}, \sec(\theta) = \frac{\sqrt{5}}{2}, \cot(\theta) = 2$
32. $\sin(\theta) = \frac{1}{5}, \cos(\theta) = -\frac{2\sqrt{6}}{5}, \tan(\theta) = -\frac{\sqrt{6}}{12}, \csc(\theta) = 5, \sec(\theta) = -\frac{5\sqrt{6}}{12}, \cot(\theta) = -2\sqrt{6}$
33. $\sin(\theta) = -\frac{\sqrt{110}}{11}, \cos(\theta) = -\frac{\sqrt{11}}{11}, \tan(\theta) = \sqrt{10}, \csc(\theta) = -\frac{\sqrt{110}}{10}, \sec(\theta) = -\sqrt{11}, \cot(\theta) = \frac{\sqrt{10}}{10}$
34. $\sin(\theta) = -\frac{\sqrt{95}}{10}, \cos(\theta) = \frac{\sqrt{5}}{10}, \tan(\theta) = -\sqrt{19}, \csc(\theta) = -\frac{2\sqrt{95}}{19}, \sec(\theta) = 2\sqrt{5}, \cot(\theta) = -\frac{\sqrt{19}}{19}$

35. $\csc(78.95^\circ) \approx 1.019$
36. $\tan(-2.01) \approx 2.129$
37. $\cot(392.994) \approx 3.292$
38. $\sec(207^\circ) \approx -1.122$
39. $\csc(5.902) \approx -2.688$
40. $\tan(39.672^\circ) \approx 0.829$
41. $\cot(3^\circ) \approx 19.081$
42. $\sec(0.45) \approx 1.111$
43. $\tan(\theta) = \sqrt{3}$ when $\theta = \frac{\pi}{3} + \pi k$ for any integer k
44. $\sec(\theta) = 2$ when $\theta = \frac{\pi}{3} + 2\pi k$ or $\theta = \frac{5\pi}{3} + 2\pi k$ for any integer k
45. $\csc(\theta) = -1$ when $\theta = \frac{3\pi}{2} + 2\pi k$ for any integer k .
46. $\cot(\theta) = \frac{\sqrt{3}}{3}$ when $\theta = \frac{\pi}{3} + \pi k$ for any integer k
47. $\tan(\theta) = 0$ when $\theta = \pi k$ for any integer k
48. $\sec(\theta) = 1$ when $\theta = 2\pi k$ for any integer k
49. $\csc(\theta) = 2$ when $\theta = \frac{\pi}{6} + 2\pi k$ or $\theta = \frac{5\pi}{6} + 2\pi k$ for any integer k .
50. $\cot(\theta) = 0$ when $\theta = \frac{\pi}{2} + \pi k$ for any integer k
51. $\tan(\theta) = -1$ when $\theta = \frac{3\pi}{4} + \pi k$ for any integer k
52. $\sec(\theta) = 0$ never happens
53. $\csc(\theta) = -\frac{1}{2}$ never happens
54. $\sec(\theta) = -1$ when $\theta = \pi + 2\pi k = (2k + 1)\pi$ for any integer k
55. $\tan(\theta) = -\sqrt{3}$ when $\theta = \frac{2\pi}{3} + \pi k$ for any integer k
56. $\csc(\theta) = -2$ when $\theta = \frac{7\pi}{6} + 2\pi k$ or $\theta = \frac{11\pi}{6} + 2\pi k$ for any integer k
57. $\cot(\theta) = -1$ when $\theta = \frac{3\pi}{4} + \pi k$ for any integer k
58. $\cot(t) = 1$ when $t = \frac{\pi}{4} + \pi k$ for any integer k
59. $\tan(t) = \frac{\sqrt{3}}{3}$ when $t = \frac{\pi}{6} + \pi k$ for any integer k

60. $\sec(t) = -\frac{2\sqrt{3}}{3}$ when $t = \frac{5\pi}{6} + 2\pi k$ or $t = \frac{7\pi}{6} + 2\pi k$ for any integer k

61. $\csc(t) = 0$ never happens

62. $\cot(t) = -\sqrt{3}$ when $t = \frac{5\pi}{6} + \pi k$ for any integer k

63. $\tan(t) = -\frac{\sqrt{3}}{3}$ when $t = \frac{5\pi}{6} + \pi k$ for any integer k

64. $\sec(t) = \frac{2\sqrt{3}}{3}$ when $t = \frac{\pi}{6} + 2\pi k$ or $t = \frac{11\pi}{6} + 2\pi k$ for any integer k

65. $\csc(t) = \frac{2\sqrt{3}}{3}$ when $t = \frac{\pi}{3} + 2\pi k$ or $t = \frac{2\pi}{3} + 2\pi k$ for any integer k

66. $\theta = 30^\circ$, $a = 3\sqrt{3}$, $c = \sqrt{108} = 6\sqrt{3}$

67. $\alpha = 56^\circ$, $b = 12 \tan(34^\circ) \approx 8.094$, $c = 12 \sec(34^\circ) = \frac{12}{\cos(34^\circ)} \approx 14.475$

68. $\theta = 43^\circ$, $a = 6 \cot(47^\circ) = \frac{6}{\tan(47^\circ)} \approx 5.595$, $c = 6 \csc(47^\circ) = \frac{6}{\sin(47^\circ)} \approx 8.204$

69. $\beta = 40^\circ$, $b = 2.5 \tan(50^\circ) \approx 2.979$, $c = 2.5 \sec(50^\circ) = \frac{2.5}{\cos(50^\circ)} \approx 3.889$

70. The side adjacent to θ has length $4\sqrt{3} \approx 6.928$

71. The side opposite θ has length $10 \sin(15^\circ) \approx 2.588$

72. The side opposite θ is $2 \tan(87^\circ) \approx 38.162$

73. The hypotenuse has length $14 \csc(38.2^\circ) = \frac{14}{\sin(38.2^\circ)} \approx 22.639$

74. The side adjacent to θ has length $3.98 \cos(2.05^\circ) \approx 3.977$

75. The side opposite θ has length $31 \tan(42^\circ) \approx 27.912$

76. The tree is about 47 feet tall.

77. The lights are about 75 feet apart.

78. (b) The fire is about 4581 feet from the base of the tower.

(c) The Sasquatch ran $200 \cot(6^\circ) - 200 \cot(6.5^\circ) \approx 147$ feet in those 10 seconds. This translates to ≈ 10 miles per hour. At the scene of the second sighting, the Sasquatch was ≈ 1755 feet from the tower, which means, if it keeps up this pace, it will reach the tower in about 2 minutes.

79. The tree is about 41 feet tall.

80. The boat has traveled about 244 feet.

81. The tower is about 682 feet tall. The guy wire hits the ground about 731 feet away from the base of the tower.