

1–20 ■ Find the exact value of the trigonometric function at the given real number.

1. (a) $\sin 0$
(b) $\cos 0$
3. (a) $\sin(-\pi)$
(b) $\cos(-\pi)$
5. (a) $\sin \frac{\pi}{2}$
(b) $\sin \frac{3\pi}{2}$
7. (a) $\cos \frac{\pi}{2}$
(b) $\cos \frac{5\pi}{2}$
9. (a) $\cos \frac{7\pi}{3}$
(b) $\sec \frac{7\pi}{3}$
11. (a) $\cos \frac{\pi}{3}$
(b) $\cos\left(-\frac{\pi}{3}\right)$
13. (a) $\tan \frac{\pi}{6}$
(b) $\tan\left(-\frac{\pi}{6}\right)$
15. (a) $\sec \frac{11\pi}{3}$
(b) $\csc \frac{11\pi}{3}$
17. (a) $\sin \frac{9\pi}{4}$
(b) $\csc \frac{9\pi}{4}$
19. (a) $\tan\left(-\frac{\pi}{4}\right)$
(b) $\cot\left(-\frac{\pi}{4}\right)$
2. (a) $\sin \pi$
(b) $\cos \pi$
4. (a) $\cos \frac{\pi}{6}$
(b) $\cos \frac{5\pi}{6}$
6. (a) $\sin \frac{7\pi}{6}$
(b) $\cos \frac{7\pi}{6}$
8. (a) $\sin \frac{5\pi}{6}$
(b) $\sec \frac{5\pi}{6}$
10. (a) $\sin \frac{3\pi}{4}$
(b) $\cos \frac{3\pi}{4}$
12. (a) $\sin \frac{\pi}{6}$
(b) $\sin\left(-\frac{\pi}{6}\right)$
14. (a) $\tan \frac{\pi}{3}$
(b) $\cot \frac{\pi}{3}$
16. (a) $\sec \frac{13\pi}{6}$
(b) $\sec\left(-\frac{13\pi}{6}\right)$
18. (a) $\sec \pi$
(b) $\csc \frac{\pi}{2}$
20. (a) $\tan \frac{3\pi}{4}$
(b) $\tan \frac{11\pi}{4}$

21–24 ■ Find the value of each of the six trigonometric functions (if it is defined) at the given real number t . Use your answers to complete the table.

21. $t = 0$ 22. $t = \frac{\pi}{2}$ 23. $t = \pi$ 24. $t = \frac{3\pi}{2}$

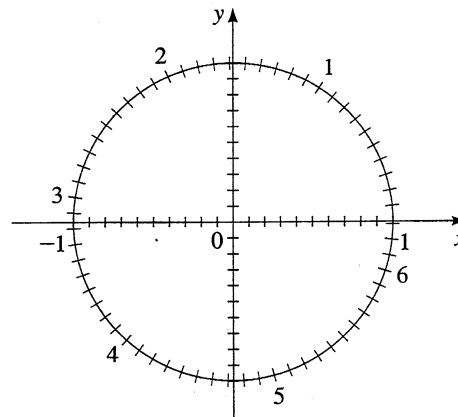
t	$\sin t$	$\cos t$	$\tan t$	$\csc t$	$\sec t$	$\cot t$
0	0	1		undefined		
$\frac{\pi}{2}$						
π			0			undefined
$\frac{3\pi}{2}$						

25–32 ■ The terminal point $P(x, y)$ determined by t is given. Find $\sin t$, $\cos t$, and $\tan t$.

25. $\left(\frac{3}{5}, \frac{4}{5}\right)$
26. $\left(-\frac{3}{5}, \frac{4}{5}\right)$
27. $\left(\frac{6}{7}, -\frac{\sqrt{13}}{7}\right)$
28. $\left(-\frac{1}{3}, -\frac{2\sqrt{2}}{3}\right)$
29. $\left(\frac{40}{41}, \frac{9}{41}\right)$
30. $\left(-\frac{3}{5}, -\frac{4}{5}\right)$
31. $\left(-\frac{5}{13}, -\frac{12}{13}\right)$
32. $\left(\frac{\sqrt{5}}{5}, \frac{2\sqrt{5}}{5}\right)$

33–40 ■ Find the approximate value of the given trigonometric function by using (a) the figure and (b) a calculator. Compare the two values.

33. $\sin 1$
34. $\cos 0.8$
35. $\sin 1.2$
36. $\cos 5$
37. $\tan 0.8$
38. $\tan(-1.3)$
39. $\cos 4.1$
40. $\sin(-5.2)$



41–44 ■ Find the sign of the expression if the terminal point determined by t is in the given quadrant.

41. $\tan t \cos t$, t in quadrant II
42. $\sin^2 t \cos t$, t in quadrant IV
43. $\frac{\tan t \sin t}{\cot t}$, t in quadrant III
44. $\cos t \sec t$, t in any quadrant

45–48 ■ From the information given, find the quadrant in which the terminal point determined by t lies.

45. $\sin t > 0$ and $\cos t < 0$
46. $\tan t > 0$ and $\sin t < 0$
47. $\csc t > 0$ and $\sec t < 0$
48. $\cos t < 0$ and $\cot t < 0$

49–58 ■ Write the first expression in terms of the second if the terminal point determined by t is in the given quadrant.

49. $\sin t$, $\cos t$; t in quadrant II
50. $\cos t$, $\sin t$; t in quadrant IV
51. $\tan t$, $\sin t$; t in quadrant IV
52. $\tan t$, $\cos t$; t in quadrant III
53. $\sec t$, $\tan t$; t in quadrant II
54. $\csc t$, $\cot t$; t in quadrant III
55. $\tan t$, $\sec t$; t in quadrant III
56. $\sin t$, $\sec t$; t in quadrant IV
57. $\tan^2 t$, $\sin t$; t in any quadrant
58. $\sec^2 t \sin^2 t$, $\cos t$; t in any quadrant

59–66 ■ Find the values of the trigonometric functions of t from the given information.

59. $\sin t = \frac{3}{5}$, t in quadrant II
60. $\cos t = -\frac{4}{5}$, t in quadrant III
61. $\tan t = -\frac{3}{4}$, $\cos t > 0$
62. $\sec t = 3$, t in quadrant IV
63. $\sec t = 2$, $\sin t < 0$
64. $\tan t = \frac{1}{4}$, t in quadrant III
65. $\sin t = -\frac{1}{4}$, $\sec t < 0$
66. $\tan t = -4$, t in quadrant II