Chapter 5 • Trigonometric Functions

EXERCISE SET 5.3

Practice Exercises

In Exercises 1–8, a point on the terminal side of angle \( \theta \) is given. Find the exact value of each of the six trigonometric functions of \( \theta \).

1. \((-4, 3)\)  
2. \((-12, 5)\)  
3. \((2, 3)\)  
4. \((3, 7)\)  
5. \((3, -3)\)  
6. \((5, -5)\)  
7. \((-2, -5)\)  
8. \((-1, -3)\)

In Exercises 9–16, evaluate the trigonometric function at the quadrant angle, or state that the expression is undefined.

9. \(\cos \pi\)  
10. \(\tan \pi\)  
11. \(\sec \pi\)  
12. \(\csc \pi\)  
13. \(\tan \frac{3\pi}{2}\)  
14. \(\cos \frac{3\pi}{2}\)  
15. \(\cot \frac{\pi}{2}\)  
16. \(\tan \frac{\pi}{2}\)

In Exercises 17–22, let \( \theta \) be an angle in standard position. Name the quadrant in which \( \theta \) lies.

17. \(\sin \theta > 0, \quad \cos \theta > 0\)  
18. \(\sin \theta < 0, \quad \cos \theta > 0\)  
19. \(\sin \theta < 0, \quad \cos \theta < 0\)  
20. \(\tan \theta < 0, \quad \sin \theta < 0\)  
21. \(\tan \theta < 0, \quad \cos \theta < 0\)  
22. \(\cot \theta > 0, \quad \sec \theta < 0\)

In Exercises 23–34, find the exact value of each of the remaining trigonometric functions of \( \theta \).

23. \(\cos \theta = -\frac{5}{12}, \quad \theta \) in quadrant III  
24. \(\sin \theta = -\frac{13}{12}, \quad \theta \) in quadrant III  
25. \(\sin \theta = \frac{5}{13}, \quad \theta \) in quadrant II  
26. \(\cos \theta = \frac{1}{2}, \quad \theta \) in quadrant IV  
27. \(\cos \theta = \frac{8}{17}, \quad 270^\circ < \theta < 360^\circ\)  
28. \(\cos \theta = \frac{1}{2}, \quad 270^\circ < \theta < 360^\circ\)  
29. \(\tan \theta = -\frac{2}{3}, \quad \sin \theta > 0\)  
30. \(\tan \theta = -\frac{4}{3}, \quad \sin \theta > 0\)  
31. \(\tan \theta = \frac{1}{2}, \quad \cos \theta < 0\)  
32. \(\tan \theta = \frac{5}{12}, \quad \cos \theta < 0\)  
33. \(\sec \theta = -3, \quad \tan \theta > 0\)  
34. \(\csc \theta = -4, \quad \tan \theta > 0\)
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In Exercises 35–50, find the reference angle for each angle.

| 35. 160° | 36. 170° |
| 37. 205° | 38. 210° |
| 39. 355° | 40. 351° |
| 41. \(\frac{7\pi}{4}\) | 42. \(\frac{5\pi}{4}\) |
| 43. \(\frac{5\pi}{6}\) | 44. \(\frac{5\pi}{7}\) |
| 45. \(-150°\) | 46. \(-250°\) |
| 47. \(-335°\) | 48. \(-359°\) |
| 49. 4.7 | 50. 5.5 |

In Exercises 51–66, use reference angles to find the exact value of each expression. Do not use a calculator.

| 51. \(\cos 225°\) | 52. \(\sin 300°\) |
| 53. \(\tan 210°\) | 54. \(\sec 240°\) |
| 55. \(\tan 420°\) | 56. \(\tan 405°\) |
| 57. \(\sin \frac{2\pi}{3}\) | 58. \(\cos \frac{3\pi}{4}\) |
| 59. \(\csc \frac{7\pi}{6}\) | 60. \(\cot \frac{7\pi}{4}\) |
| 61. \(\tan \frac{9\pi}{4}\) | 62. \(\tan \frac{9\pi}{2}\) |
| 63. \(\sin (-240°)\) | 64. \(\sin (-225°)\) |
| 65. \(\tan \left(-\frac{\pi}{4}\right)\) | 66. \(\tan \left(-\frac{\pi}{6}\right)\) |

**Writing in Mathematics**

67. If you are given a point on the terminal side of angle \(\theta\), explain how to find \(\sin \theta\).
68. Explain why \(\tan 90°\) is undefined.
69. If \(\cos \theta > 0\) and \(\tan \theta < 0\), explain how to find the quadrant in which \(\theta\) lies.
70. What is a reference angle? Give an example with your description.
71. Explain how reference angles are used to evaluate trigonometric functions. Give an example with your description.