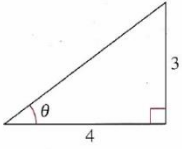


Double and Half Angles: Complete 1-7 odd, 22, 23, 31, 33, 35, 39, 46, 47, 49, 81, 84, 85

In Exercises 1-8, use the figure to find the exact value of the trigonometric function.

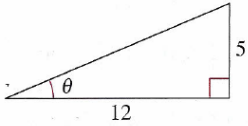


- | | |
|-------------------|-------------------|
| 1. $\sin \theta$ | 2. $\tan \theta$ |
| 3. $\cos 2\theta$ | 4. $\sin 2\theta$ |
| 5. $\tan 2\theta$ | 6. $\sec 2\theta$ |
| 7. $\csc 2\theta$ | 8. $\cot 2\theta$ |

In Exercises 21-24, find the exact values of $\sin 2u$, $\cos 2u$, and $\tan 2u$ using the double-angle formulas.

21. $\sin u = \frac{3}{5}$, $0 < u < \pi/2$
22. $\cos u = -\frac{2}{7}$, $\pi/2 < u < \pi$
23. $\tan u = \frac{1}{2}$, $\pi < u < 3\pi/2$
24. $\cot u = -6$, $3\pi/2 < u < 2\pi$

In Exercises 31-38, use the figure to find the exact value of the trigonometric function.



- | | |
|---|---|
| 31. $\cos \frac{\theta}{2}$ | 32. $\sin \frac{\theta}{2}$ |
| 33. $\tan \frac{\theta}{2}$ | 34. $\sec \frac{\theta}{2}$ |
| 35. $\csc \frac{\theta}{2}$ | 36. $\cot \frac{\theta}{2}$ |
| 37. $2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$ | 38. $2 \cos \frac{\theta}{2} \tan \frac{\theta}{2}$ |

In Exercises 39-46, use the half-angle formulas to determine the exact values of the sine, cosine, and tangent of the angle.

- | | |
|----------------------|-----------------------|
| 39. 15° | 40. 165° |
| 41. $112^\circ 30'$ | 42. $157^\circ 30'$ |
| 43. $\frac{\pi}{8}$ | 44. $\frac{\pi}{12}$ |
| 45. $\frac{3\pi}{8}$ | 46. $\frac{7\pi}{12}$ |

In Exercises 47-50, find the exact values of $\sin(u/2)$, $\cos(u/2)$ and $\tan(u/2)$ using the half-angle formulas.

47. $\sin u = \frac{5}{13}$, $\pi/2 < u < \pi$
48. $\cos u = \frac{7}{25}$, $0 < u < \pi/2$
49. $\tan u = -\frac{8}{5}$, $3\pi/2 < u < 2\pi$
50. $\cot u = 7$, $\pi < u < 3\pi/2$

In Exercises 81-92, verify the identity algebraically. Use a graphing utility to confirm the identity graphically.

81. $\csc 2\theta = \frac{\csc \theta}{2 \cos \theta}$ 82. $\sec 2\theta = \frac{\sec^2 \theta}{2 - \sec^2 \theta}$

83. $\cos^2 2\alpha - \sin^2 2\alpha = \cos 4\alpha$

84. $\cos^4 x - \sin^4 x = \cos 2x$

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