

# 6.4 Exercises

In Exercises 1–8, find the exact value of each expression.

1. (a)  $\cos\left(\frac{\pi}{6} + \frac{\pi}{3}\right)$  (b)  $\cos\frac{\pi}{6} + \cos\frac{\pi}{3}$
2. (a)  $\sin\left(\frac{2\pi}{3} + \frac{3\pi}{4}\right)$  (b)  $\sin\frac{2\pi}{3} + \sin\frac{3\pi}{4}$
3. (a)  $\sin\left(\frac{7\pi}{6} - \frac{\pi}{3}\right)$  (b)  $\sin\frac{7\pi}{6} - \sin\frac{\pi}{3}$
4. (a)  $\cos\left(\frac{5\pi}{4} - \frac{\pi}{6}\right)$  (b)  $\cos\frac{5\pi}{4} - \cos\frac{\pi}{6}$
5. (a)  $\cos(0^\circ + 135^\circ)$  (b)  $\cos 0^\circ + \cos 135^\circ$
6. (a)  $\cos(240^\circ - 0^\circ)$  (b)  $\cos 240^\circ - \cos 0^\circ$
7. (a)  $\sin(315^\circ - 60^\circ)$  (b)  $\sin 315^\circ - \sin 60^\circ$
8. (a)  $\sin(390^\circ + 120^\circ)$  (b)  $\sin 390^\circ + \sin 120^\circ$

In Exercises 9–18, use the sum and difference formulas to find the exact values of the sine, cosine, and tangent of the angle.

9.  $75^\circ = 30^\circ + 45^\circ$  10.  $15^\circ = 45^\circ - 30^\circ$
11.  $105^\circ = 60^\circ + 45^\circ$  12.  $165^\circ = 135^\circ + 30^\circ$
13.  $195^\circ = 225^\circ - 30^\circ$  14.  $285^\circ = 330^\circ - 45^\circ$
15.  $\frac{11\pi}{12} = \frac{3\pi}{4} + \frac{\pi}{6}$  16.  $\frac{17\pi}{12} = \frac{7\pi}{6} + \frac{\pi}{4}$
17.  $-\frac{\pi}{12} = \frac{\pi}{6} - \frac{\pi}{4}$  18.  $-\frac{19\pi}{12} = \frac{2\pi}{3} - \frac{9\pi}{4}$

In Exercises 19–28, use the sum and difference formulas to write the expression as the sine, cosine, or tangent of an angle.

19.  $\cos 40^\circ \cos 15^\circ - \sin 40^\circ \sin 15^\circ$
20.  $\sin 110^\circ \cos 80^\circ + \cos 110^\circ \sin 80^\circ$
21.  $\sin 340^\circ \cos 50^\circ - \cos 340^\circ \sin 50^\circ$
22.  $\cos 20^\circ \cos 30^\circ + \sin 20^\circ \sin 30^\circ$
23.  $\frac{\tan 325^\circ - \tan 86^\circ}{1 + \tan 325^\circ \tan 86^\circ}$  24.  $\frac{\tan 140^\circ - \tan 60^\circ}{1 + \tan 140^\circ \tan 60^\circ}$
25.  $\sin 3 \cos 1.2 - \cos 3 \sin 1.2$
26.  $\cos 0.88 \cos 0.34 + \sin 0.88 \sin 0.34$
27.  $\cos\frac{\pi}{7} \cos\frac{\pi}{5} - \sin\frac{\pi}{7} \sin\frac{\pi}{5}$
28.  $\sin\frac{2\pi}{9} \cos\frac{\pi}{10} + \cos\frac{2\pi}{9} \sin\frac{\pi}{10}$

*Numerical, Graphical, and Algebraic Analysis* In Exercises 29–34, use a graphing utility to complete the table and graph the two functions. Use both table and graph as evidence that  $y_1 = y_2$ . Then verify the identity algebraically.

x	0.2	0.4	0.6	0.8	1.0	1.2	1.4
$y_1$							
$y_2$							

29.  $y_1 = \sin\left(\frac{\pi}{2} + x\right)$ ,  $y_2 = \cos x$
30.  $y_1 = \sin(3\pi - x)$ ,  $y_2 = \sin x$
31.  $y_1 = \sin\left(\frac{\pi}{6} + x\right)$ ,  $y_2 = \frac{1}{2}(\cos x + \sqrt{3} \sin x)$
32.  $y_1 = \cos\left(\frac{5\pi}{4} - x\right)$ ,  $y_2 = -\frac{\sqrt{2}}{2}(\cos x + \sin x)$
33.  $y_1 = \cos(x + \pi)\cos(x - \pi)$ ,  $y_2 = \cos^2 x$
34.  $y_1 = \sin(x + \pi)\sin(x - \pi)$ ,  $y_2 = \sin^2 x$

In Exercises 35–38, find the exact value of the trigonometric function given that

$$\sin u = 5/13, \text{ where } 0 < u < \pi/2$$

$$\cos v = -3/5, \text{ where } \pi/2 < v < \pi.$$

35.  $\sin(u + v)$  36.  $\cos(v - u)$
37.  $\cos(u + v)$  38.  $\sin(u - v)$

In Exercises 39–42, find the exact value of the trigonometric function given that

$$\sin u = 7/25, \text{ where } \pi/2 < u < \pi$$

$$\cos v = 4/5, \text{ where } 3\pi/2 < v < 2\pi.$$

39.  $\cos(u + v)$  40.  $\sin(u + v)$
41.  $\sin(v - u)$  42.  $\cos(u - v)$

In Exercises 43–50, verify the identity.

43.  $\cos(\pi - \theta) + \sin\left(\frac{\pi}{2} + \theta\right) = 0$
44.  $\sin(\theta + \pi) + \cos\left(\theta - \frac{\pi}{2}\right) = 0$