

**Trigonometric Functions**

1. (a) Given that  $\sin(t) = \frac{6}{7}$  and  $t$  is in quadrant II.  
Find the exact value  $\cos(t)$ ,  $\tan(t)$ ,  $\sec(t)$ ,  $\csc(t)$ , and  $\cot(t)$ .
- (b) Given that  $\cos(t) = \frac{-3}{5}$  and  $t$  is in quadrant III.  
Find the exact value  $\sin(t)$ ,  $\tan(t)$ ,  $\sec(t)$ ,  $\csc(t)$ , and  $\cot(t)$ .

**Angles and Radian Measures**

2. (a) Convert the angle  $-225^\circ$  to radians. Express answer as a multiple of  $\pi$ .
- (b) Convert the angle  $\frac{3\pi}{2}$  radians to degrees.
3. (a) Find a positive angle less than  $360^\circ$  that is coterminal with the angle  $-760^\circ$ .
- (b) Find a positive angle less than  $2\pi$  radians that is coterminal with the angle  $\frac{17\pi}{2}$ .
4. Find the length of arc on a circle with radius  $r = 16$  inches intercepted by a central angle  $\theta = 60^\circ$ . Round the answer to 2 decimal places.
5. If the length of the arc on a circle of radius 10 cm is 20 cm, find the measure of the central angle in degrees.
6. Draw  $620^\circ$  in standard position. Find a coterminal angle for  $620^\circ$  between  $0^\circ$  and  $360^\circ$ . Find a coterminal angle less than zero for  $620^\circ$ . Find the reference angle for  $620^\circ$ .

**Applications**

7. A telephone pole is 55 feet tall. How long should a guy wire be if it to be attached 15 feet from the top and is to make an angle of  $35^\circ$  with the ground? Give your answer to the nearest tenth of a foot.
8. A plane is flying at an altitude of 9000m. The pilot finds that the angle of depression to the airport is  $20^\circ$ . Find the distance between a point on the ground directly below the plane and the airport.

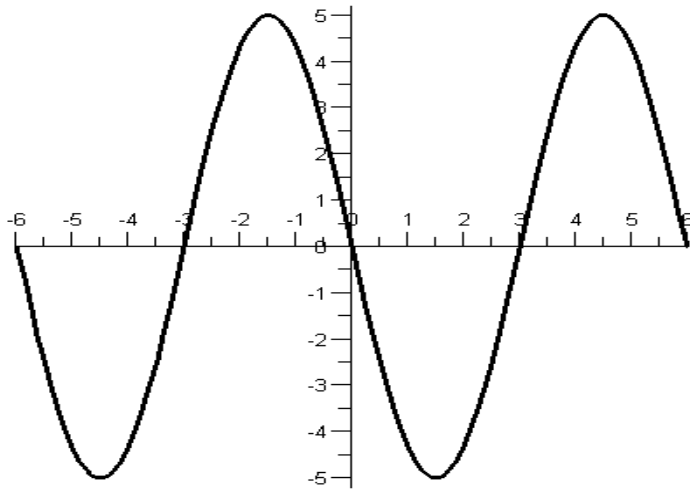
**Reference Angle**

9. Find the reference angle for each of the following angles;  
a)  $210^\circ$       b)  $-250^\circ$       c)  $\frac{23\pi}{4}$       d)  $-\frac{13\pi}{3}$

**Graphs of Trigonometric Functions**

10. (a) Given the function  $y = -2\sin\left(2x + \frac{\pi}{2}\right)$  find the amplitude, period, and phase shift.
- (b) Given the function  $y = 4\cos(3x + \pi)$  find the amplitude, period, and phase shift.

11. Find the equation for the graph shown below.



12. (a) Suppose  $\sin(-t) = \frac{-1}{2}$  and  $\cos(-t) = \frac{\sqrt{3}}{2}$ , find  $\tan(t)$

(b) Suppose  $\sin(-t) = -0.32$  find  $\csc(t)$ .

13. (a) Graph the function  $f(x) = 2 \sec(x)$  to determine the range of  $f(x)$ .

(b) Graph the function  $g(x) = 3 \csc(x)$  to determine the range of  $g(x)$ .

### Inverse Trigonometric Functions

Find the exact value of each of the following:

14.  $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)$

15.  $\cos\left[\tan^{-1}\left(\frac{2}{3}\right)\right]$

16.  $\tan(\cos^{-1} x)$

17.  $\sin^{-1}\left[\sin\left(\frac{2\pi}{3}\right)\right]$

18.  $\cos^{-1}[\cos(135^\circ)]$

19.  $\sin^{-1}\left[\sin\left(\frac{7\pi}{6}\right)\right]$

20.  $\cos\left(\sin^{-1}\left(\frac{x}{3}\right)\right)$

21.  $\tan(\sin^{-1}(3x))$

### Verifying Trigonometric Identities

Verify each trigonometric identity:

22.  $(\cos(\theta) - \sin(\theta))^2 + (\cos(\theta) + \sin(\theta))^2 = 2$

23.  $\frac{\tan(\theta) \cdot \cot(\theta)}{\csc(\theta)} = \sin(\theta)$

24.  $\tan(\theta) + \frac{\cos(\theta)}{1 + \sin(\theta)} = \sec(\theta)$

25.  $\cot(x) + \tan(x) = \sec(x) \csc(x)$

26.  $(\sec(x) - \tan(x))^2 = \frac{1 - \sin(x)}{1 + \sin(x)}$

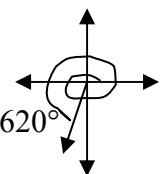
**Answers** (some of which have the possibility of not being incorrect)

$$1. \text{ a) } \cos(t) = -\frac{\sqrt{13}}{7} \quad \tan(t) = -\frac{6}{\sqrt{13}} = -\frac{6\sqrt{13}}{13} \quad \sec(t) = -\frac{7}{\sqrt{13}} = -\frac{7\sqrt{13}}{13}$$

$$\text{csc}(t) = \frac{7}{6} \quad \cot(t) = -\frac{\sqrt{13}}{6}$$

$$\text{b) } \sin(t) = -\frac{4}{5} \quad \tan(t) = \frac{4}{3} \quad \cot(t) = \frac{3}{4} \quad \csc(t) = -\frac{5}{4} \quad \sec(t) = -\frac{5}{3}$$

$$2. \text{ a) } -\frac{5\pi}{4} \quad \text{b) } 270^\circ \quad 3. \text{ a) } 320^\circ \quad \text{b) } \frac{\pi}{2} \quad 4. \text{ } 16.76 \text{ cm} \quad 5. \text{ } 114.59^\circ$$

6.  coterminal angles:  $260^\circ, -100^\circ$  reference angle:  $80^\circ$

$$7. \text{ } 69.7 \text{ feet} \quad 8. \text{ } 24727.3 \text{ m} \quad 9. \text{ a) } 30^\circ \quad \text{b) } 70^\circ \quad \text{c) } \frac{\pi}{4} \quad \text{d) } \frac{\pi}{3}$$

$$10. \text{ a) } \text{amplitude} = 2, \text{ period} = \pi, \text{ phase shift} = \frac{\pi}{4} \text{ to the left}$$

$$\text{b) } \text{amplitude} = 4, \text{ period} = \frac{2\pi}{3}, \text{ phase shift} = \frac{\pi}{3} \text{ to the left}$$

$$11. \text{ } -5 \sin\left(\frac{\pi}{3}x\right) \text{ or } 5 \sin\left(\frac{\pi}{3}(x-3)\right) \text{ or } 5 \sin\left(\frac{\pi}{3}(x+3)\right) \text{ or } 5 \cos\left(\frac{\pi}{3}(x-4.5)\right)$$

$$12. \text{ a) } \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3} \quad \text{b) } 3.125 \quad 13. \text{ a) } (-\infty, -2] \cup [2, \infty) \quad \text{b) } (-\infty, -3] \cup [3, \infty)$$

$$14. \text{ } -60^\circ \text{ or } -\frac{\pi}{3} \quad 15. \frac{3\sqrt{13}}{13} \quad 16. \frac{\sqrt{1-x^2}}{x} \quad 17. \frac{\pi}{3} \text{ or } 60^\circ \quad 18. \text{ } 135^\circ \text{ or } \frac{3\pi}{4}$$

$$19. \text{ } -30^\circ \text{ or } -\frac{\pi}{6} \quad 20. \frac{\sqrt{9-x^2}}{3} \quad 21. \frac{3x}{\sqrt{1-9x^2}}$$

### Verifying Trigonometric Identities

Methods may vary.