

**Angles and Radian Measures (Section 4.1)**

1. (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.
2. (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  $\frac{17\pi}{2}$ .
3. 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.
4. 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.
5. 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  $620^\circ$ .

**Trigonometric Functions (Section 4.2)**

6. (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  $\cot(t)$ .

**Applications (Section 4.3)**

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 (Section 4.3)**

9. Find the reference angle for each of the following angles;

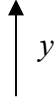
a)  $210^\circ$       b)  $-250^\circ$       c)  $\frac{23\pi}{4}$       d)  $-\frac{13\pi}{3}$

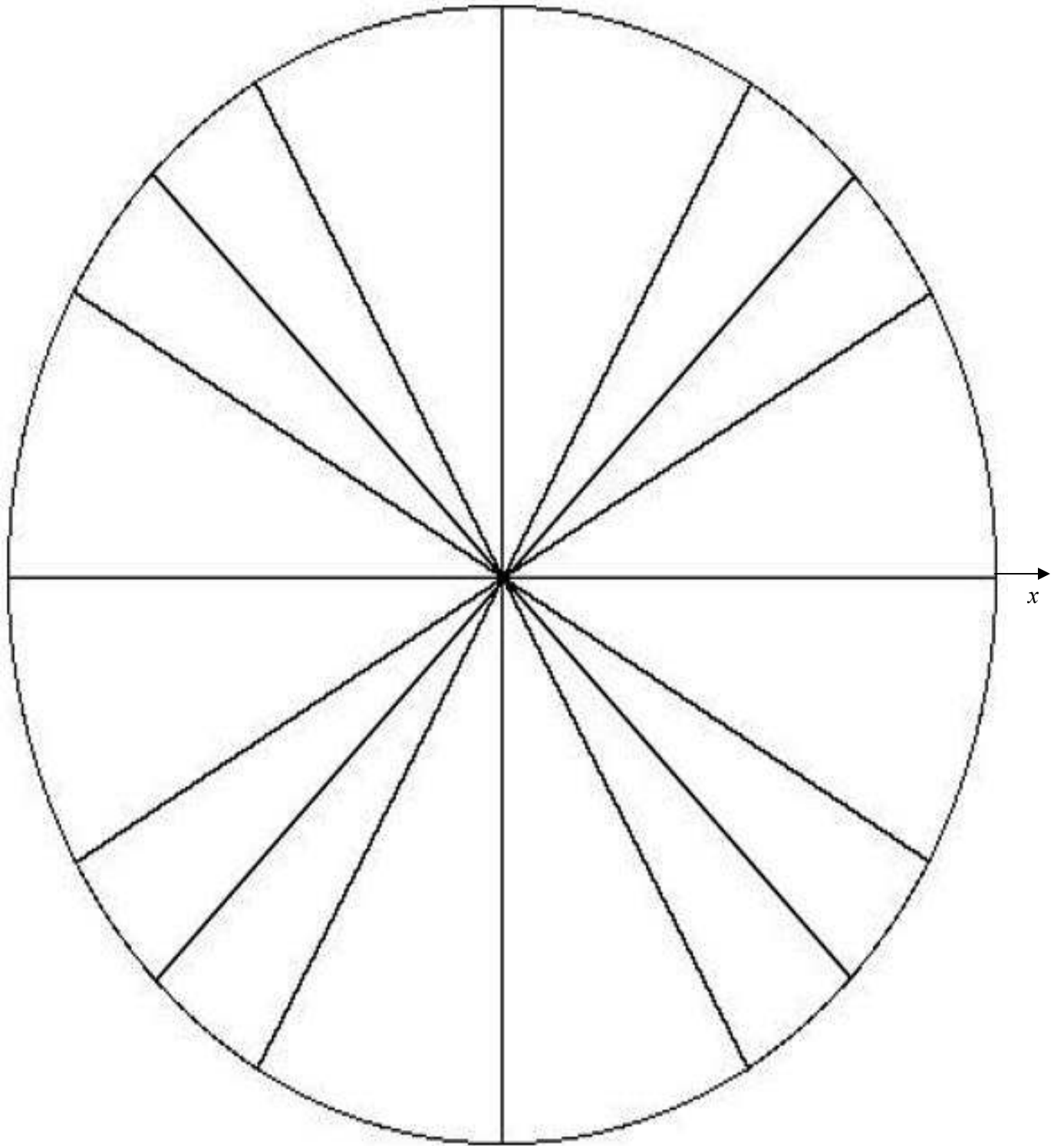
**Graphs of Trigonometric Functions (Section 4.5 - 4.6)**

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.



28. (**Section 4.2**) Label the unit circle, i.e. label all the special angles, and the  $x$  and  $y$  coordinates for the angles.





**Sum and Difference Formulas (Section 5.2)**

29. Find the exact value of the expression:  $\cos \frac{5\pi}{12} \cos \frac{\pi}{12} + \sin \frac{5\pi}{12} \sin \frac{\pi}{12}$

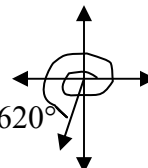
30. Find the exact value of the expression:  $\cos(135^\circ + 30^\circ)$

31. Find the exact value of the expression:  $\frac{\tan \frac{\pi}{5} - \tan \frac{\pi}{30}}{1 + \tan \frac{\pi}{5} \tan \frac{\pi}{30}}$

32. Verify the identity:  $\cos(x - \frac{\pi}{2}) = \sin x$

## Answers

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

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

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

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

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

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

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

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

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

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

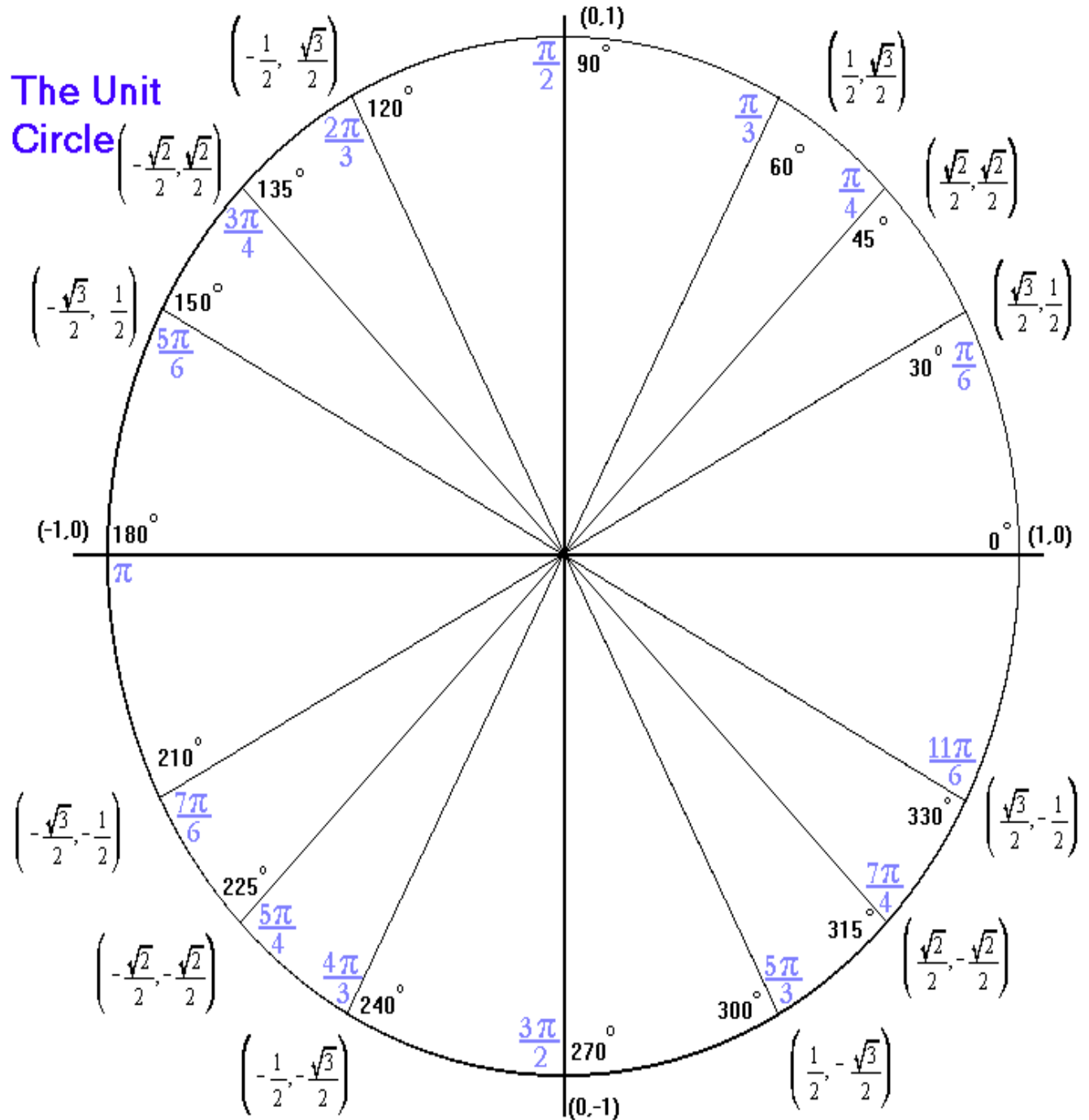
14.  $-60^\circ$  or  $-\frac{\pi}{3}$       15.  $\frac{3\sqrt{13}}{13}$       16.  $\frac{\sqrt{1-x^2}}{x}$       17.  $\frac{\pi}{3}$  or  $60^\circ$       18.  $135^\circ$  or  $\frac{3\pi}{4}$

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

## **Verifying Trigonometric Identities**

Methods may vary.

## 28. THE UNIT CIRCLE



29.  $\frac{1}{2}$     30.  $-\frac{1}{4}\sqrt{2}(\sqrt{3}+1)$     31.  $\frac{\sqrt{3}}{3}$     32. Methods may vary.