Math 240 Exam 2 Review Questions Chapters 3 and 4

Do the following problems as indicated.

1. Convert each degree measure to radians (leave as multiples of π), and convert each radian measure to degrees.

   a. 800° b. $-\frac{23\pi}{20}$ c. -890° d. $\frac{19\pi}{12}$

2. Convert each degree measure to radians (accurate to 3 decimal places), and convert each radian measure to degrees (to the nearest minute).

   a. 116° 35' 28" b. 45 c. -123° 56' 49" d. -22.5

3. Evaluate each expression. Give exact values.

   a. $10\csc\frac{7\pi}{4}-9\sec\frac{7\pi}{6}$

   b. $6\sin^2\frac{\pi}{2}+12\tan^2\frac{25\pi}{6}$

   c. $3\cot\frac{8\pi}{3}-4\sin\frac{17\pi}{4}+16\cos\frac{29\pi}{6}$

   d. $2\sin\frac{\pi}{6}\cos\frac{\pi}{6}$

   e. $\cos^2\frac{5\pi}{4}-\sin^2\frac{5\pi}{4}$

   f. $8\tan\frac{20\pi}{3}\cot\frac{15\pi}{4}$

4. Find the exact value of s in the given interval that has the given circular function value. Do not use a calculator.

   a. $\left[\frac{\pi}{2},\pi\right]$; $\cos s=-\frac{\sqrt{2}}{2}$ b. $\left[\pi,\frac{3\pi}{2}\right]$; $\tan s=\frac{\sqrt{3}}{3}$ c. $\left[\frac{3\pi}{2},2\pi\right]$; $\sin s=-\frac{\sqrt{3}}{2}$

5. Use a calculator to find a decimal approximation for each value, accurate to four decimal places.

   a. $\sin 30$ c. $\cos 60$ e. $\tan(-5.76)$

   b. $\csc 45$ d. $\sec(-.5169)$ f. $\cot\sqrt{3}$

6. Find a value of s in $\left[0,\frac{\pi}{2}\right]$ that satisfies each statement. Round to three decimal places.

   a. $\tan s=100$ c. $\sec s=\sqrt{3}$ e. $\sin s=.0578$

   b. $\cos s=.0124$ d. $\cot s=.8765$ f. $\csc s=6$

7. Find the exact value of each expression without using a calculator.

   a. $\sin\frac{2\pi}{3}$ b. $\cos\frac{11\pi}{6}$ c. $\tan\left(-\frac{10\pi}{3}\right)$ d. $\sec\left(-\frac{5\pi}{4}\right)$ e. $\csc\frac{7\pi}{2}$

8. Find the distance in km between each pair of cities, assuming they lie on the same north-south line. Assume the radius of the earth is 6400 km.

   a. Farmersville, CA, $36^\circ N$, and Penticton, BC, $49^\circ N$

   b. Halifax, Nova Scotia, $45^\circ N$, and Buenos Aires, Argentina, $34^\circ S$

9. Find the radius of the larger wheel if the smaller wheel of radius 11.7 cm rotates 80° when the larger wheel rotates 50°. The rotation of the smaller wheel causes the larger wheel to rotate.

10. In the U.S., circular railroad curves are designed by the degree of curvature, the central angle subtended by a chord of 200 ft. Suppose a portion of track has curvature 36°.
    a. What is the radius of the curve?
    b. What is the length of the arc determined by the 200-foot chord?
    c. What is the area of the segment of the circle bounded by the arc and the 200-ft chord?

11. Find v and ω for each of the following.
    a. the tip of the minute hand of a clock, if the hand is 10 cm long
    b. a point on the tread of a tire of radius 24 cm, rotating 32 revolutions per minute

12. A thread is being pulled off a spool at the rate of 72.5 cm per sec. Find the radius of the spool if it makes 230 revolutions per minute.

13. The Rolls-Royce Griffin 58 boat racer has a 2450-horsepower outboard motor which takes off at 2750 revolutions per minute. Find the angular velocity of the propeller in radians per second.

14. A Ferris wheel has radius 50 ft. A person takes a seat and then the wheel turns $\frac{5\pi}{6}$ radians. How far is the person above the ground? If it takes 30 seconds for the wheel to turn $\frac{5\pi}{6}$ radians, what is the angular speed of the wheel?

15. Find the measure (in radians) of a central angle of a sector of area of 36 sq. inches in a circle of radius of 4.5 in.

16. Find the radius of a circle in which a central angle of $\frac{2\pi}{3}$ radian determines a sector of 81 sq. meters.

17. For each defined function, give the amplitude (if any), period, and new origin (phase shift and vertical translation). Do not graph.
    a. $y = -5 - \frac{3}{4}\sin(\frac{4}{3}x - \frac{\pi}{3})$
    b. $y = 6 + 5\cot(4x + \frac{\pi}{2})$
    c. $y = 2 + \frac{2}{3}\csc\pi(x + \frac{3}{4})$
    d. $y = 4 + 2\cos\left(3x + \frac{\pi}{2}\right)$
    e. $y = -1 + \tan\left(\pi x - \frac{\pi}{6}\right)$
    f. $y = -\frac{1}{2} - \frac{3}{2}\sec\left(2x - \frac{\pi}{5}\right)$

18. Graph each defined function over one period interval. Identify the period, amplitude (if any) and new origin (phase shift and vertical translation).
    a. $y = -2 + 3\sin\left(\frac{1}{2}x + \pi\right)$
    b. $y = 3 - \tan(3x - \frac{\pi}{2})$
    c. $y = 1 + 2\sec(6x + \pi)$
    d. $y = 4 - \cos 2\left(x - \frac{\pi}{4}\right)$
    e. $y = -\frac{1}{2} - 2\cot\frac{\pi}{2}\left(x + 1\right)$
    f. $y = -3 - 3\csc\frac{\pi}{3}\left(x - \frac{3}{2}\right)$