Math 163 - Trigonometry

Final Exam Review

Convert the degree measure to <u>exact</u> radian measure. Show your work.

1. *(3pts)* 13^0

Convert the angle measure to <u>exact</u> degree measure. Show your work.

2. *(3pts)* $-\frac{\pi}{8}$

3. *(3pts)* What is the length of the arc of a circle of radius 2 meters subtended by a central angle of 0.25 radians? Round the result to two 2 decimal places.

4. *(3pts)* What is the area of the sector of a circle of radius 5 feet formed by an angle of 30^0 ? Round the result to two decimal places.

Application Problem

5. Your friend has a garden in the shape of a sector of a circle, the outer rim of the garden is 25 feet long and the central angle of the sector is 50^0 . She wants to add a 3-foot wide walk to the outer rim.

a. *(3pts)* How many square feet of paving blocks will she need to build the walk?
b. *(1pt)* Write a well-structured sentence with the units correctly stated.

Application Problem

6. A race car is driven around a circular track at a constant speed of 180 miles per hour. The diameter of the circle is one-half mile.

a. *(3pts)* Find the angular speed of the car.
b. *(1pt)* Write a well-structured sentence with the units correctly stated.

Application Problem

7. A carnival has merry-go-round whose radius is 25 feet. You measure the time it takes for one revolution to be 30 seconds.

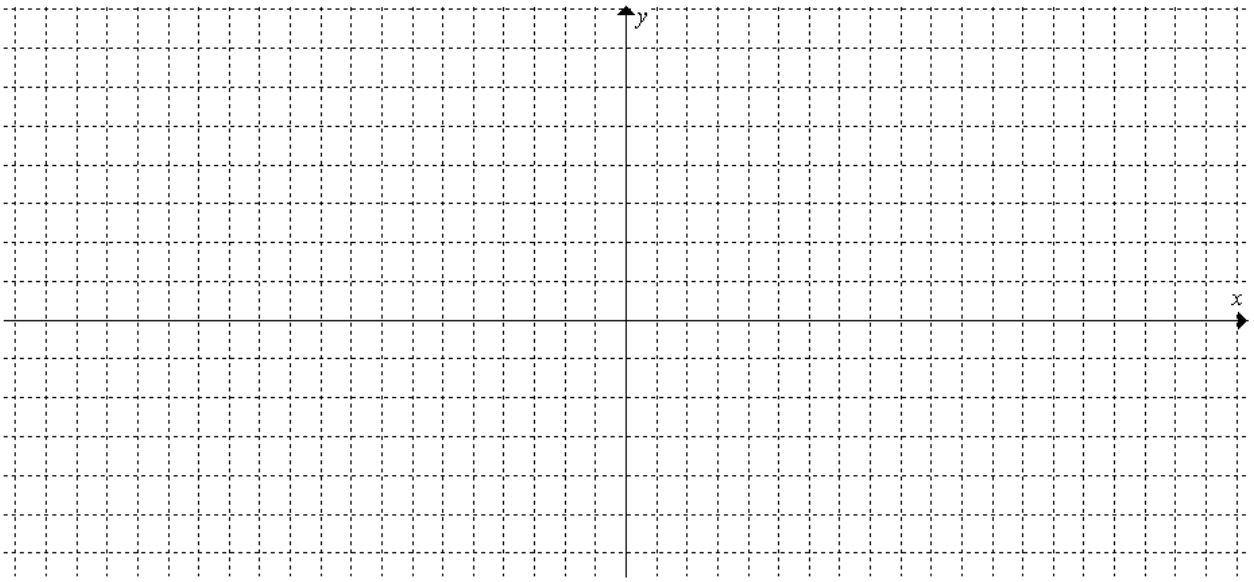
a. *(3pts)* Find the linear speed of the merry-go-round.
b. *(1pt)* Write a well-structured sentence with the units correctly stated.

The point (x, y) is on the terminal side of an angle θ in standard form. Find the exact value of the given trigonometric function.

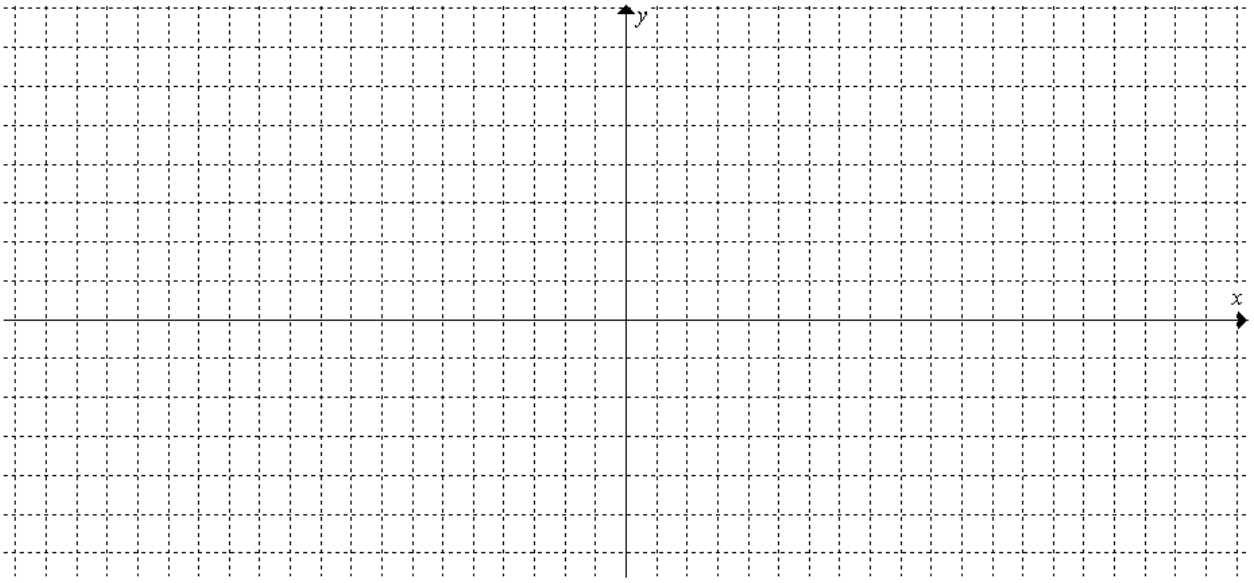
8. *(3pts)* $(2,7)$, $\sin\theta$ **9.** *(3pts)* $(-5,11)$, $\cos\theta$ **10.** *(3pts)* $(6,-3)$, $\tan\theta$

Sketch the graph of the function. Include two full periods. Identify any amplitudes, periods, horizontal shifts, vertical shifts, asymptotes, key points.

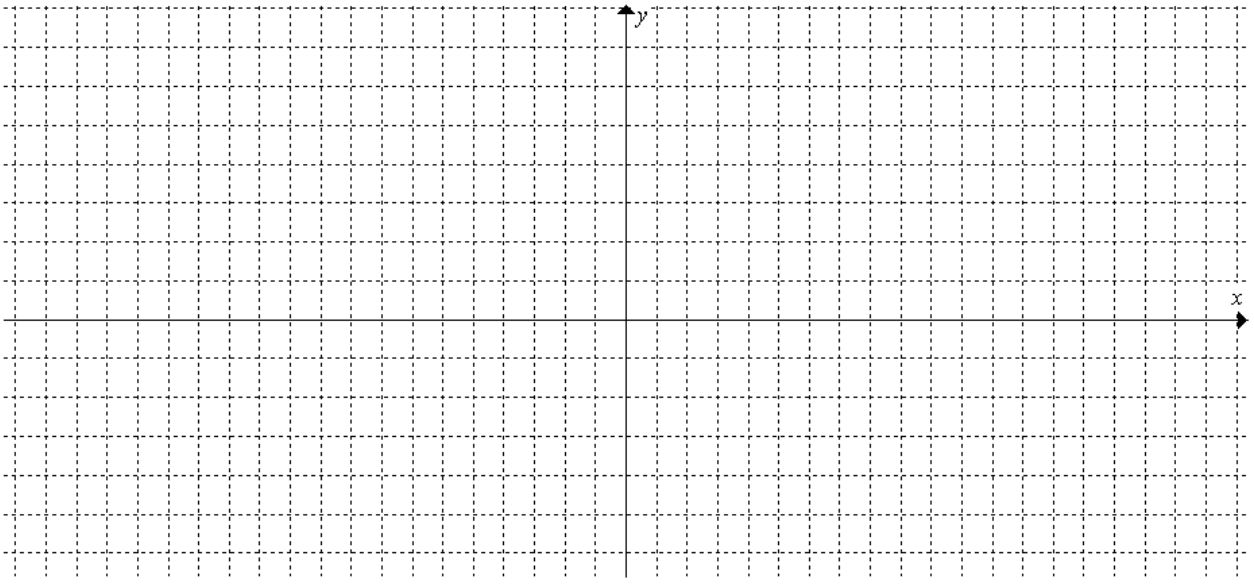
11. *(5pts)* $f(x) = -\cos\left(\frac{x}{2} + \frac{\pi}{2}\right)$



12. *(5pts)* $f(x) = 2\sin\left(\frac{x}{3} - \frac{\pi}{6}\right)$



13. *(5pts)* $g(x) = \tan\left(-x + \frac{\pi}{4}\right) + 2$



Application Problem

14. An object in simple harmonic motion has position function $s(t)$ inches from an equilibrium point is modeled by

$$s(t) = 4\sin \pi t$$

where *t* is the time in seconds.

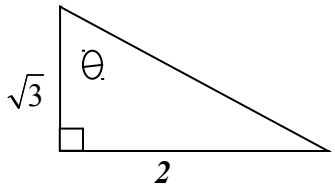
a. *(3pts)* Find the period and what does the period represent.

b. *(3pts)* Find the amplitude and what does the amplitude represent.

c. *(3pts)* Find the frequency and what does the frequency represent.

Find the exact value of the six trigonometric functions of the angle θ for the given right triangle.

15. *(5pts)*



Application Problem

16. A straight trail leads from the hotel, elevation 8000 feet, to a scenic overlook, elevation 11,100 feet. The length of the trail is 14,100 feet.

a. *(3pts)* What is the inclination (angle of elevation) of the trail?
b. *(1pt)* Write a well-structured sentence with the units correctly stated.

Application Problem

17. On top of the Board of Trade building in Chicago is a statue of Ceres, the Roman goddess of wheat. From the street, two observations are taken 400 feet from the center of the building. The angle of elevation to the base of the statue is 55.1^0 and the angle of elevation to the top of the statue is 56.5^0.

a. *(3pts)* What is the height of the statue rounded to the nearest foot?
b. *(1pt)* Write a well-structured sentence with the units correctly stated.

Find the exact values of the remaining five trigonometric functions given the following information.

18. *(5pts)* $\sin\theta = \frac{1}{2}$ and $\cos\theta < 0$

Use the fundamental trigonometric identities to simplify the expression.

19. *(3pts)* $\csc^2 x - \cos^2 x \csc^2 x$

20. *(3pts)* $\frac{\sin x + \tan x}{1 + \cos x}$

Find all solutions of the equation in the interval $[0, 2\pi)$ **.**

21. *(4pts)* $2\sin\theta + \sqrt{3} = 0$

22. *(4pts)* $3\cos\theta + 3 = 2\sin^2\theta$

23. *(4pts)* $2\cos^2\theta - 7\cos\theta - 4 = 0$

Find all solutions of the equation in the interval $[0, 2\pi)$ **.**

24. *(4pts)* $5\csc\theta - 3 = 2$

25. *(4pts)* $2\sin\frac{\pi}{2} = 1$

26. *(4pts)* $\cos 2x = \cos x$

Find the exact value of the trigonometric function given the following information.

$$\cos u = \frac{\sqrt{5}}{5},\ 0 < u < \frac{\pi}{2} \quad \text{and} \quad \sin v = -\frac{4}{5},\ -\frac{\pi}{2} < v < 0$$

27. *(4pts)* $\cos(u - v)$

Find the exact value of $\sin 2u$ **,** $\cos 2u$ ***, and*** $\tan 2u$ ***using the double-angle formulas.***

28. *(6pts)* $\sin u = \frac{3}{5},\quad \frac{\pi}{2} < u < \pi$

Application Problem

29. A runner's arm swings rhythmically according to the model

$$y = \frac{\pi}{8}\cos\left[\pi\left(t - \frac{1}{3}\right)\right]$$

where *y* represents the angle between the actual position of the upper arm and the downward vertical position, and *t* represents time in seconds. is the time in seconds.

a. *(3pts)* At what times over the interval $[0,3)$ is the angle *y* equal to 0?

b. *(3pts)* Write a well-structured sentence with the units correctly stated.