Final Exam
Circular Motion Review

Chapter 9

Equations:

$$F_c = \frac{mv^2}{r} \qquad a_c = \frac{v^2}{r} \qquad v = \frac{2\pi r}{T} \qquad f = \frac{1}{T}$$

Concepts:

1. If the frequency of a rotating object increases, the period of rotation
   a. Increases.
   b. Decreases.
   c. May increase or decrease.
   d. Remains the same.

2. A bicycle wheel turns at a rate of 60 rpm. This is equal to
   a. 60 Hz. b. 0.02 Hz. c. 1 Hz. d. 6 Hz.

3. You are driving home from school and you notice that when you take a sharp right turn your body leans to the left. This is caused by
   a. Centripetal force.
   b. Centrifugal force.
   c. Inertia.
   d. Conservation of momentum.

Questions 4 to 7 refer to the following:
A small ball is tied to the end of a string and swung in a horizontal circle.

4. The direction of the force on the ball is
   a. Toward the center.
   b. Tangent to the path.
   c. Away from the center.

5. The direction of the acceleration of the ball is
   a. Toward the center.
   b. Tangent to the path.
   c. Away from the center.

6. If the string suddenly snapped, the ball would fly off
   a. Toward the center.
   b. Tangent to the path.
   c. Away from the center.
   d. And continue and a circular path.

7. The small ball on a string is now swung in a vertical circle. Where along the path is the string most likely to break?
   a. At the top of the path.
   b. At the bottom of the path.
   c. Somewhere in the middle, but definitely not at the top or the bottom of the path.
   d. The ball is equally likely to break at any point along the path.

8. If you double the radius of the circular path, and keep the speed the same, the centripetal force
   a. Decreases by a factor of two.
   b. Decreases by a factor of four.
   c. Increases by a factor of two.
   d. Increases by a factor of four.

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Problems:

1. A little boy is on a Merry-go-Round that is rotating with a constant rate of 10 rpm. He is sitting 5 meters from the center of the ride.
   a. How many seconds does it take to rotate once?

   b. What is his linear speed?

   c. What is the magnitude and direction of his acceleration?

   d. If he were to sit 3 meters from the center, what would be his linear speed?

   e. If he were to sit 3 meters from the center, what would be his rotational speed?

   f. If he were to sit 3 meters from the center, what would be his acceleration?

2. A 1500 kg car is driving in a circle with a radius of 20 meters with a constant speed of 5 m/s.
   a. What is the period of this motion?

   b. What is the frequency of this motion?

   c. What is the centripetal force on the car?

   d. Where does the centripetal force come from?

   e. If the car were to have the same speed, but twice the centripetal force, how fast would it go?