CP Physics Quiz – Circular Motion **Name: _____**

Section 1 – Think and Explain (4 pts. each)

1. Distinguish between linear speed and angular speed.
2. When a wheel rotates about a fixed axis, do all the points on the wheel have the same tangential speed? Explain.
3. Explain how it is possible for a car to have centripetal acceleration but no tangential acceleration.
4. Can a car go around a circular racetrack so that it has a tangential acceleration but no centripetal acceleration? If so, how?
5. If you attached an object to one end of a spring scale and held the other end while whirling it around in a circle above your head, explain why the spring stretches.
6. Why would you weigh slightly less at the equator than you would at one of the poles?
7. Explain why the faster the earth spins, the less a person weighs, whereas the faster a space station spins, the more a person weighs.
8. What do physicists mean when they say that the moon is constantly "falling toward the earth"?
9. Explain why banking a turn on a racetrack allows cars to go faster around the track than if the track were flat.
10. Draw a sketch of the wheels on a train, and discuss why they are designed that way.
11. Astronauts in the space shuttle orbiting the earth feel as though they are weightless, but in fact, the earth is still pulling on them just about as hard as when they are on the ground. Why is this?
12. If you were standing on a merry-go-round, would the centripetal force on you get bigger or smaller as you move toward the outside edge?

Section 2 – Problems (10 pts. each)

1. A 1500 kg car rounds a corner at 50km/hr. The corner has a radius of 150m. Find the following:
   a) the centripetal acceleration of the car.
   b) The centripetal force on the car.
   c) The minimum coefficient of static friction between the tires and the road that will allow the car to round the curve safely.

2. You attach one end of a string to a 1.0kg object. You hold the other end, 0.50m away, and spin the object over your head in a horizontal circle. If the string has a breaking

strength of $5.0*10^2$N, how fast can you spin the object before the string breaks? Give your answer as an angular speed.

3. How fast could you spin the object in problem #1 if you spun it in a *vertical* circle?

4. A gravity-simulating space station has a radius of 0.50km. How fast must it spin in order for people inside it to feel their normal body weight?

5. A roller coaster car speeds down a hill past point A and then rolls up a hill past point B.
   a) If the car has a mass of 400kg, and has a speed of 20m/s at pt. A, what force does the track exert on the car at pt. A?
   b) What is the maximum speed the car can have at pt. B in order for the car to stay on the track?