Physics 3344 **Professor Scalise**
Spring 2000 **Assignment #10**

Due: 11 April 2000

Read Marion & Thornton Chapter 3 and Shankar Chapter 10.

1. (a) Marion & Thornton 10-1.
   (b) Calculate the speed of a particle on the equator about the center of the Earth in m/s.
   (c) Calculate the orbital speed of the center of the Earth about the Sun in m/s.

2. More practice with free-body diagrams: My favorite amusement park ride consists of a large cylinder that spins about a vertical axis fast enough that any person inside is held up against the wall when the floor drops away. The coefficient of static friction between the person and the wall is 0.4 and the radius of the cylinder is 3 m.

   Draw the free-body diagrams labeling real and fictitious forces. What is the minimum angular speed of the ride, ω, required to prevent a rider from slipping down through the hole in the floor? Does the minimum angular speed depend on the rider's mass? Use

   (a) inertial frame analysis
   (b) non-inertial frame analysis

3. Dallas is at latitude +32° 47' 09". State the direction of the Coriolis force on a particle with instantaneous velocity

   (a) Zero, the particle is at rest relative to the Earth's surface
   (b) East
   (c) West
   (d) North
   (e) South
   (f) Up
   (g) Down

   (The Coriolis deflection is not always along one the local coordinate axes, so quote your answers as "North & East" or "South & Down" if this is the case.)

You will need to make some **reasonable** approximations in the following 3 problems. Look carefully at the examples in Marion.

4. What is the deflection (magnitude in meters **and** direction) of a point mass dropped from rest from the top of the Seattle Space Needle?

5. Marion & Thornton 10-8.

6. (a) Marion & Thornton 10-12.

   (b) At what latitude does the maximum deviation occur?

7. Marion & Thornton 3-1

8. Marion & Thornton 3-2

9. Marion & Thornton 3-3