Physics 3344 **Professor Scalise**
Fall 1997 **Assignment #8**

Due: 28 October

Read Marion & Thornton Chapter 3 and Shankar Chapter 10.

1. Given that the angular velocity vector for the Earth's rotation points along the polar axis from the South Pole to the North Pole, and that the angular velocity vector for the Earth's revolution about the Sun points in the same direction, do trees move faster in the day or at night. Explain.

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

3. 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? Use

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

4. 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 problems. Look carefully at the examples in Marion. Hit the literature.

5. Marion & Thornton 10-8.

6. (a) Marion & Thornton 10-12.
   (b) At what latitude does the maximum deviation occur?