PH 429/529 **HW #1** Spring 2006

Due Friday, 7 April 2006

1. **CATCH ON A MERRY-GO-ROUND**

This lab was originally designed for a merry-go-round in a park, but they have all been removed from Corvallis parks. So lets try to do it using the large rotating chair with a platform on top.

(a) Start the merry-go-round going counterclockwise, and (try to) play catch in several different situations, such as the following:

One person on the merry-go-round and one off.

Both on the merry-go-round, standing on a line through the center (same value of θ).

Both on the merry-go-around, standing at the same distance from the center (same value of r).

Describe in a few sentences what happens in each case. You may wish to include sketches from the point of view of observers on the ground and/or on the merry-go-round.

(b) Estimate the values of $\vec{\boldsymbol{\omega}}$, $\vec{\boldsymbol{r}}$, and $\vec{\boldsymbol{v}}$ in at least one case, and use these numbers to *calculate* the expected Coriolis deflection. Does your answer agree qualitatively with what you observed?

2. **CORIOLIS DRIFT**

In McDonald's article (see online book list), it is stated that, in the absence of friction, a car moving at 60 mph would undergo a Coriolis drift to the right of roughly 15 feet after traveling 1 mile, and that a person walking at 4 mph would similarly undergo a Coriolis drift of roughly 250 feet after 1 mile.

(a) Verify that these claims are the correct order of magnitude. You may assume a latitude of 45°.

(b) Explain briefly why the effect is larger for the pedestrian than for the car.

3. **I FEEL THE EARTH MOVE UNDER MY FEET ...**

(a) Work through Example 10.3 on pp. 399–401 in Thornton & Marion, which derives the deflection due to the Coriolis force of an object falling "straight" down. Then skim Example 10.4 on pp. 402–404, which does the same calculation in an inertial frame.

You don't need to turn anything in for this part of the problem.

(b) Do Problem 10-8 on p. 408 in Thornton & Marion, which does a similar computation for an object thrown "straight" up from the ground.

(c) The object dropped from a height winds up to the *East* of where it starts, whereas the object thrown up from the ground winds up to the *West*. Briefly (1-2 sentences; no equations) explain why.