



PH101 (Physics-I)

Tutorial-VI (September 1, 2014)

[Noninertial Frames, Rotational Motion, etc]*

1. A mass is dropped from a point directly above the equator. Consider the moment when the object has fallen a distance d . If we consider only the centrifugal force, then the correction to g_{eff} at this point (relative to the release point) is an increase by $\omega^2 d$. There is, however, also a second-order Coriolis effect. What is the sum of these corrections?
2. A uniform thin rod of length L and mass M is pivoted at one end. The pivot is attached to the top of a car accelerating at rate a_0 .
 - (a) What is the equilibrium value of the angle θ between the rod and the top of the car?
 - (b) Suppose that the rod is displaced a small angle ϕ from equilibrium. What is its motion for small ϕ ?
3. A high speed hydrofoil races across the ocean at the equator at a speed of 200 mi/h. Let the acceleration of gravity for an observer at rest on the earth be g . Find the fractional change in gravity, $\frac{\Delta g}{g}$, measured by a passenger on the hydrofoil when the hydrofoil heads in the following directions:
 - (a) East
 - (b) West
 - (c) South
 - (d) North

*Note: Please follow the strategies for “Problem Solving” explained in the class.