Circular Motion

I. Circular Motion Problems

A. Circular motion problems are NO Different than any other Newton II problem. We draw free body diagrams and inventory forces just like any other problem.

B. Coordinate Axis Trick

Choose your coordinate axis so that **ONE** of the **Axis** lies along the

_____ of the _____. The _____

in this direction is then the _____ _____ !

C. Centripetal Force

The _____ force is ANY force or

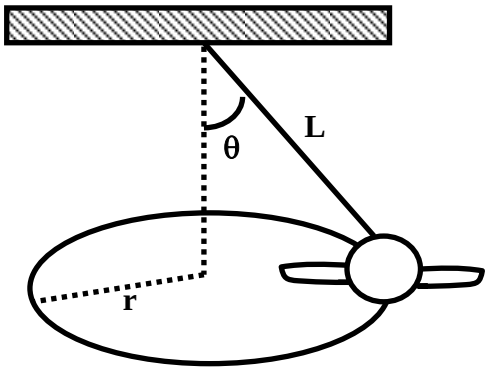
_____ of _____ that cause

_____ _____. It is NOT

a NEW Force!!

There is NO C in WANTf

Example: At a carnival ride, a small airplane of mass m is suspended by a 5.00 m rod as shown below. During the ride, the airplane revolves with constant speed v in a horizontal circle of radius r. If during the ride, the rod make a 30° angle with respect to the vertical, what is the speed of the airplane and its period of rotation.



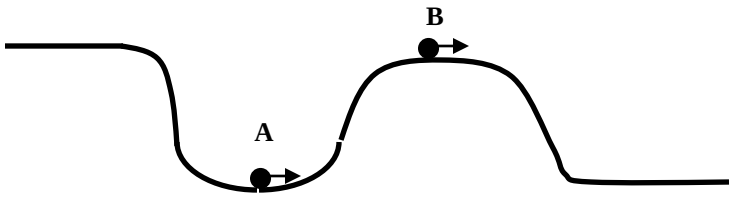
Solution:

Example: Consider a circular racetrack of radius 5000 m. If the coefficient of static friction between the race track and the car's tires is 0.450, what is the maximum speed that a car of mass 1000 kg can have before sliding assuming that

A) Race track is level

B) Race track is inclined by 20 degrees

Newton II Problem: A person is riding in a roller coaster as shown below. At point A, the coaster is traveling at 20 m/s through a loop whose radius of curvature is 10 m. At point B, the coaster is on the top of the track whose radius of curvature is 15 m. Assuming that the track is frictionless and that the total mass of the coaster/rider is 500 kg, what is



A) The normal force supplied by the track upon the coaster at point A.

B) The maximum speed that coaster can have at point B before leaving the track?

Newton II Problem: In the barrel of fun ride, the bottom of the ride is dropped out from under the passengers. What is the expression for the minimum tangential speed required to prevent the passengers from falling when the bottom is dropped.