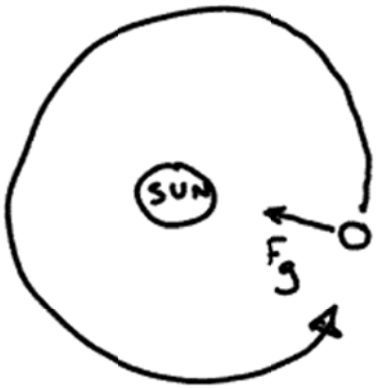
AP Physics - Circular Motion - Problem Types

Note Title 10/30/2007

Orbit Problems



Centripetal acceleration is provided entirely by gravity F_g.

$$\Sigma F = ma_c$$

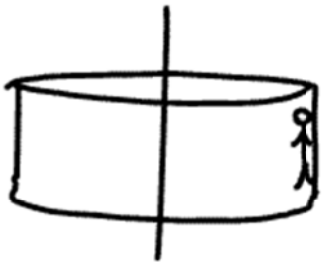
$$F_g = \frac{mv^2}{R} = \frac{m4\pi^2R}{T^2} = m4\pi^2Rf^2$$

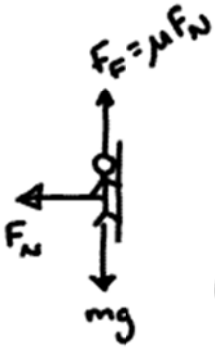
Space Station (spinning to create "artificial gravity")

(Normal force provide by inside of space station)

$$F_c = F_N = \frac{mv^2}{R}$$

Gravitron (the carnival ride)

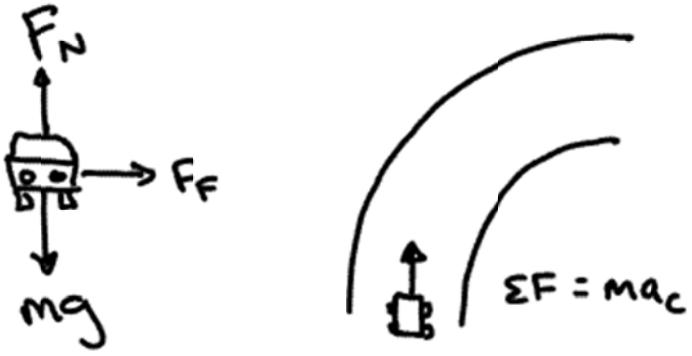




$$F_c = F_N = \frac{mv^2}{R}$$

(Note that person would drop if there wasn't enough friction!)

A car turning



In order to make the turn, the car has to have sufficient traction.

Traction = Friction = Good

No traction = No friction = car slides off road

$F_F = ma_c$

$F_F = \frac{mv^2}{R}$

Vertical Circle (Loop-de-Loop)

In order for the roller coaster not to fall, the roller coaster must be going fast enough so that $\frac{mv^2}{R} = \Sigma F_y$

The minimum speed at which this occurs is when $F_N = 0$, so that

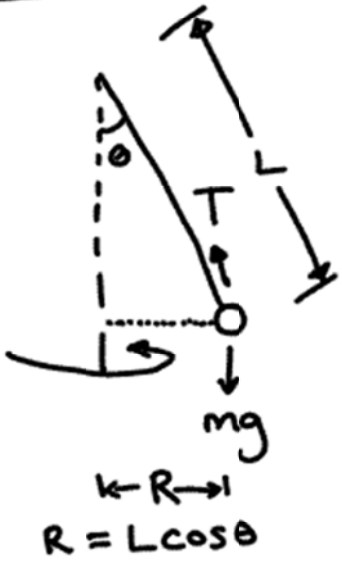
$\Sigma F_y = ma_c$

$-F_N - mg = ma_c$

$-mg = ma_c$

$g = -a_c$

Conical Pendulum - Swinging in a circle



Horizontal	Vertical
$\Sigma F_x = ma_x$	$\Sigma F_y = ma_y$
$\Sigma F_x = ma_c$	$\Sigma F_y = 0$
$T\sin\theta = ma_c$	$T\cos\theta - mg = 0$
	$T\cos\theta = mg$

System of two equations!