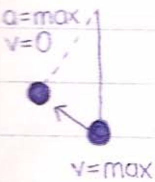
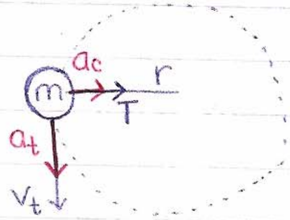
Class Notes: Lecture 20 (Biswas) 29 October 2009

Centripetal Acceleration

$a_c = v_t^2/r = \omega^2 r$

The object you're looking at doesn't always move in the direction of the force (it's not necessary)





$\vec{a_c}$ $(a_t = 0)$

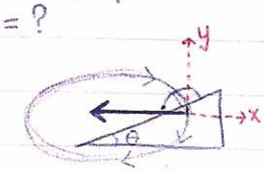
$\Sigma F = T = ma_c$

If you let go, it (the ball) will fly off in v_t direction

CQ1. From Q24

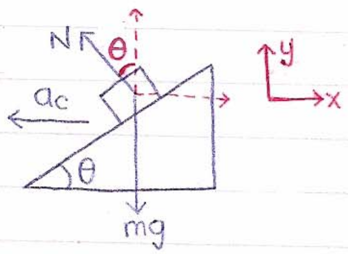
Object no longer moving up and down the incline

Direction of a_c = ?



Path (circle) of car is on horizontal axis!

See:

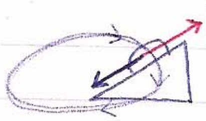


$$\left.\begin{aligned} \Sigma F_x &= -N\sin\theta = -ma_c \\ \therefore\ N\sin\theta &= m\, v_t^2/r \\ \Sigma F_y &= N\cos\theta - mg = 0 \\ \therefore\ N &= mg/\cos\theta \end{aligned}\right\} \quad mg\frac{\sin\theta}{\cos\theta} = \frac{mv_t^2}{r} \;\downarrow\; \tan\theta = v_t^2/rg$$

(24a)

(24b) $\theta = 20.1^\circ$ when $v_t = 13.4$ and $r = 50$

CQ2. Which way would friction point if $v_{car} > v_t$?



It wants to go up the ramp

So friction works against it

Note Definitions:

$F = G\frac{m_1 m_2}{r^2} \rightarrow F = G\frac{M_E m}{r^2} \rightarrow g = G\frac{M_E}{r^2}$

$h << r \rightarrow PE = mgh$ ... $h < r$ or not negligible $\rightarrow PE = -G\frac{M_E m}{r}$ At $\infty = r$, PE =

and KE = 0 (E

from PE+KE=0

Escape Speed: $v_{esc} = \sqrt{2GM_E/R_E}$ (11.2 km/s for earth)

$\tau = rF\sin\theta$

Chapter 8: torque (τ) and equilibrium

knob@center

door has τ le

than τ of kno

@ end of door