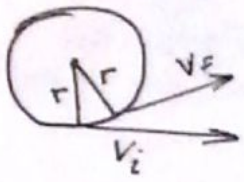
R1

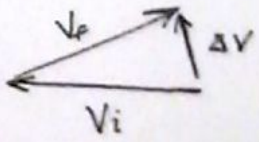
Derivation of a_c



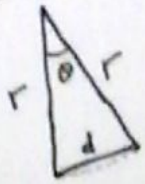
$|\vec{V}_f| = |\vec{V}_i|$ magnitude is equal, direction is not

$$a = ? = \lim_{\Delta t \to 0} \frac{\Delta V}{\Delta t} = \frac{V_f - V_i}{\Delta t}$$

$$\Delta V = V_f - V_i = -V_i + V_f$$



Vector Addition of velocities



Slice of the circle.

These two triangle are similar

$$\frac{d}{r} = \frac{\Delta V}{V}$$ cross multiply

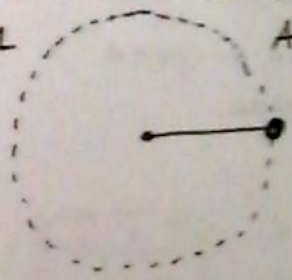
$$\boxed{\Delta V = \frac{d \cdot V}{r}}$$ substitute into acc. equation

$$a = \frac{\Delta V}{\Delta t} = \left(\frac{d \cdot V}{r}\right)\left(\frac{1}{\Delta t}\right) = \left(\frac{d}{\Delta t}\right)\left(\frac{V}{1}\right)\left(\frac{1}{r}\right) = \frac{V}{1} \cdot \frac{V}{1} \cdot \frac{1}{r} = \frac{V^2}{r}$$

$\boxed{a_c = \frac{V^2}{r}}$ centripetial accel $\quad F_{net} = ma = ma_c = F_c$

A force is needed to keep an object in circular motion

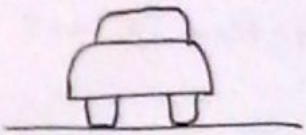
#1



A .01 kg object at the end of a string whirled in horizontal .2 m radius circle. Its speed is 3 m/s. Find the tension in the string.

Why do we not account for the force of gravity?

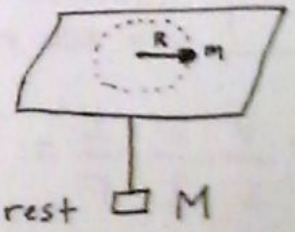
#2



$\mu_s = .6$

A car is rounding a curve with a 15 meter radius of curvature on level road. Find the maximum speed of the car to make the turn without skidding.

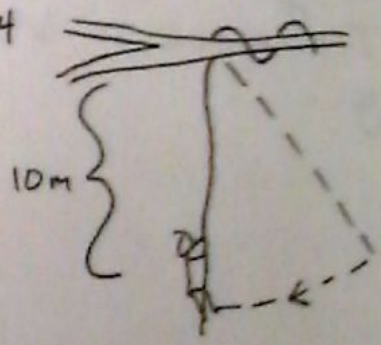
#3



at rest M

Find the speed of m if M is at rest.

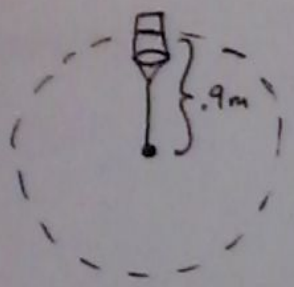
#4



Tarzan has 80kg of mass and reaches a speed of 7.7 m/s as he swings on a vine.

#5 Given the a_c calculated in #4 for Tarzan, calculate the apparent weight of Tarzan if the same acceleration were linear.

#6

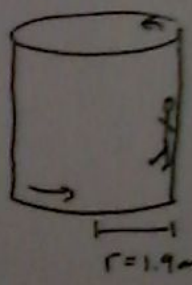


What is the minimum velocity of the 'cup of water' required for no water to spill?

#7

Find the normal force at points A and B on a ferris wheel given radius is 9 meters, 50kg person, and a 6 revolution per minute speed.

#8



A large cylinder is spinning at 30 rpm with a person inside. What is the minimum μ_s for which the person will not slide?