Phys 2110-4 9/19/11

Note Title 9/19/2011

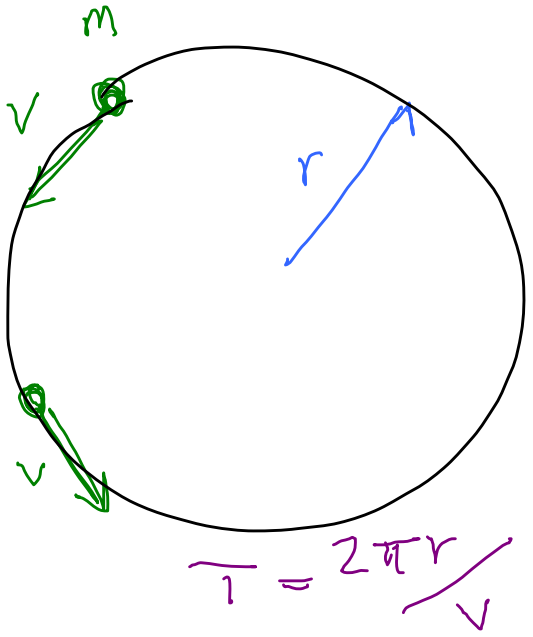
Chap 3 2-dim motion.

Uniform circular motion

Moves around the circle with (for now) constant speed, v

Radius of circle $= r$

Period of motion $= T$



$v = \frac{2\pi r}{T}$

$T = \frac{2\pi r}{v}$

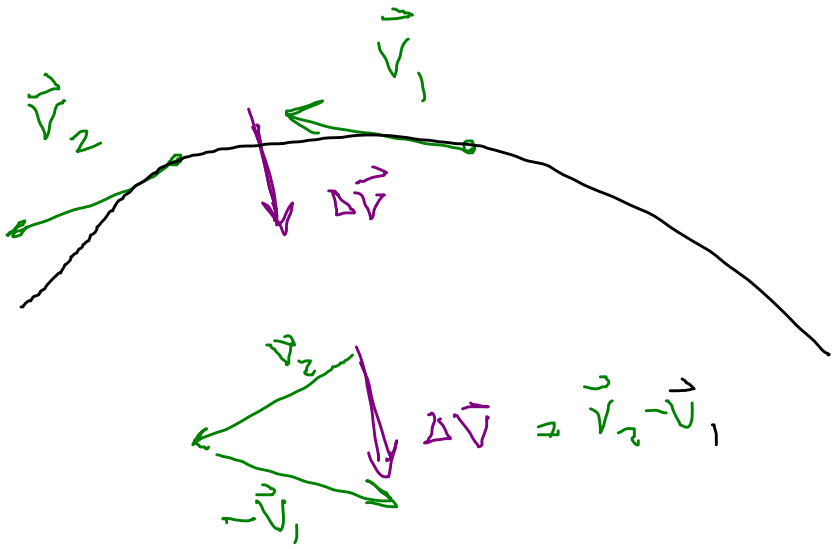
Frequency of motion = $\frac{\text{Trips around}}{\text{Time}} = 1/T = f$

Angular frequency, ω omega $\quad \omega$

$$\omega = 2\pi/T = 2\pi f$$

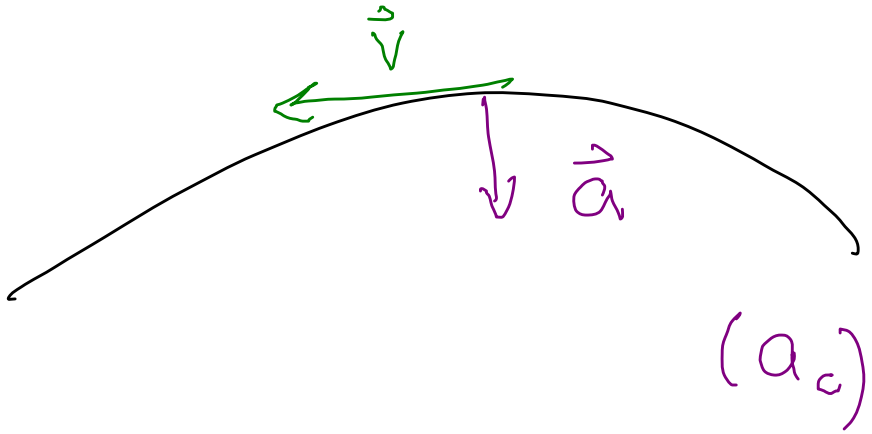
Acceleration

Acceleration points to center, centripetal

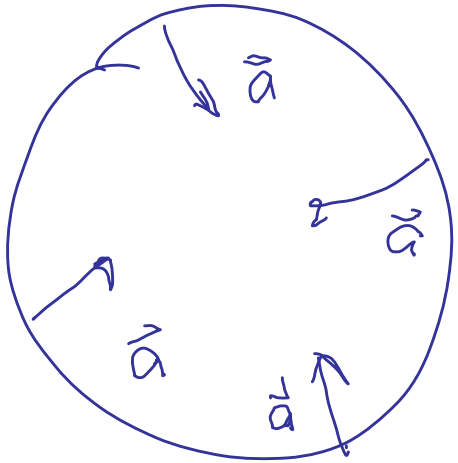


Magnitude

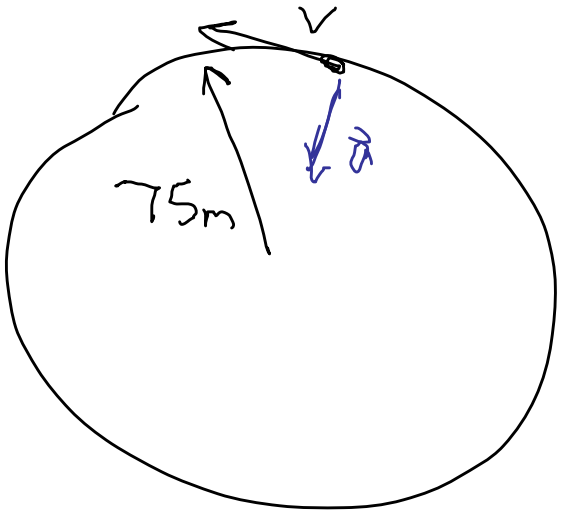
$$a = \frac{v^2}{r}$$



Not constant accel.



3.38 How fast would a car have to round 75 m-radius curve for its accel to numerically equal g.



$|\vec{a}| = g = 9.8 \frac{m}{s^2} = \frac{v^2}{r}$

$v^2 = (75m)(9.8 \frac{m}{s^2})$

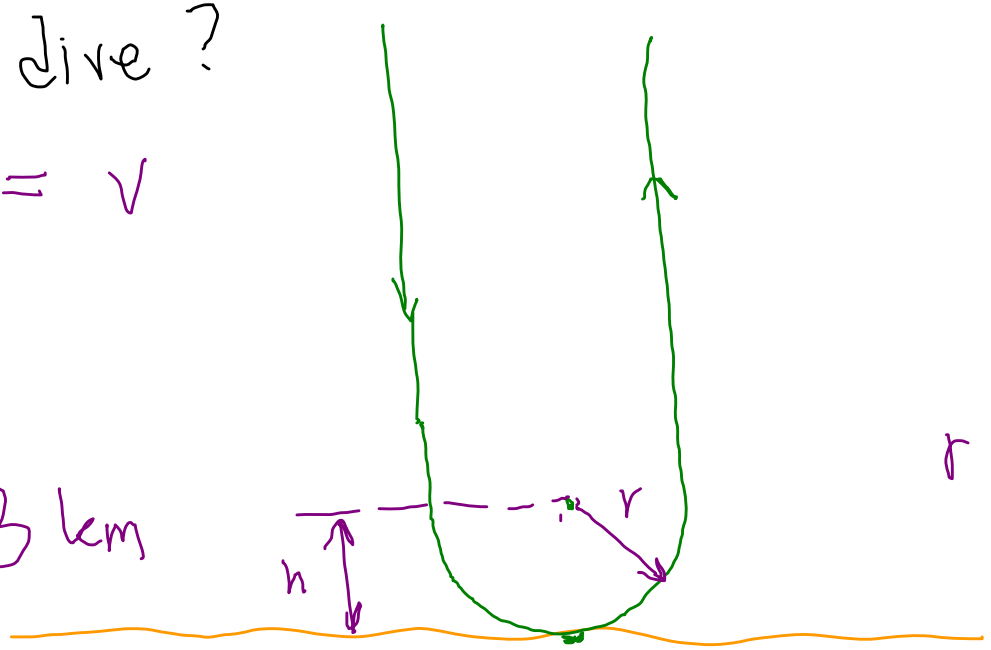
$\rightarrow v = 27.1 \frac{m}{s}$

3.69 A jet is diving vertically downward at 1200 $\frac{km}{h}$. If pilot can withstand accel. of 5g, at what height must he pull out of dive?

$1200 \frac{km}{h} = 333.3 \frac{m}{s} = v$

$a = 5g = \frac{v^2}{r}$

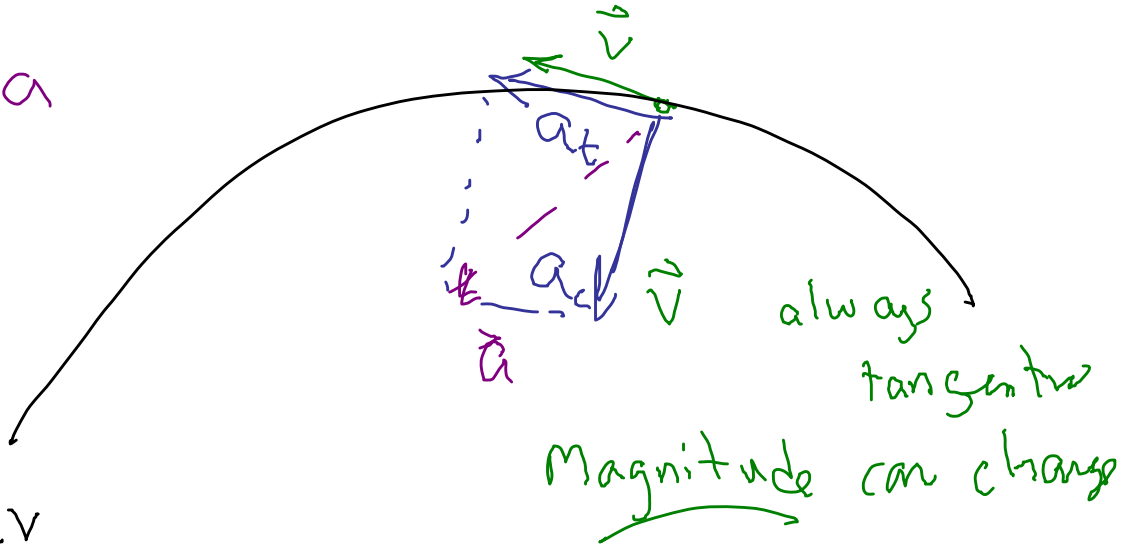
$r = \frac{v^2}{5g} = 2.3\,km$



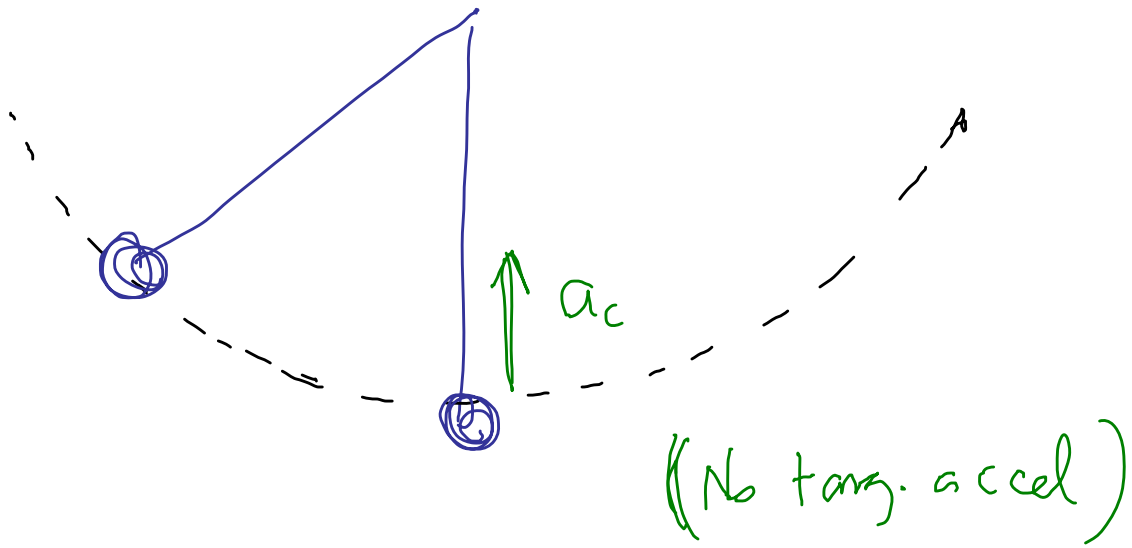
$r = h$

Non-uniform circular motion

accel now has a tangential component, a_t



$$a_c = \frac{v^2}{r} \qquad a_t = \frac{dv}{dt}$$


a_c
(No tang. accel)