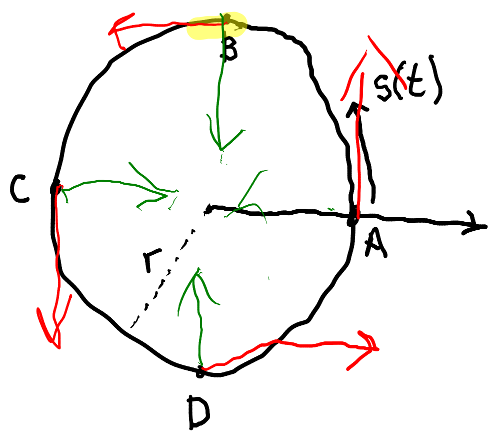
TAM 212

Topic of the Week: Tangential & Normal Components particle moving on a circular path

constant angular velocity $\dot{\theta} = \omega$



s = arc length

velocity $\vec{v}$ = tangent to the path

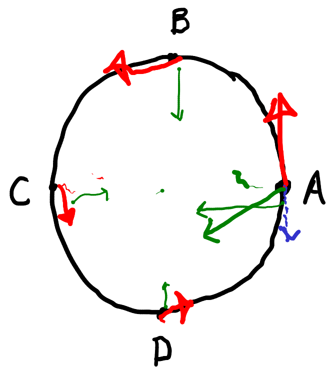
$|\vec{v}| = \omega r$

acceleration $\vec{a}$ = normal to path, directed inwards

$|\vec{a}| = \omega^2 r$

particle moving on a circular trajectory,

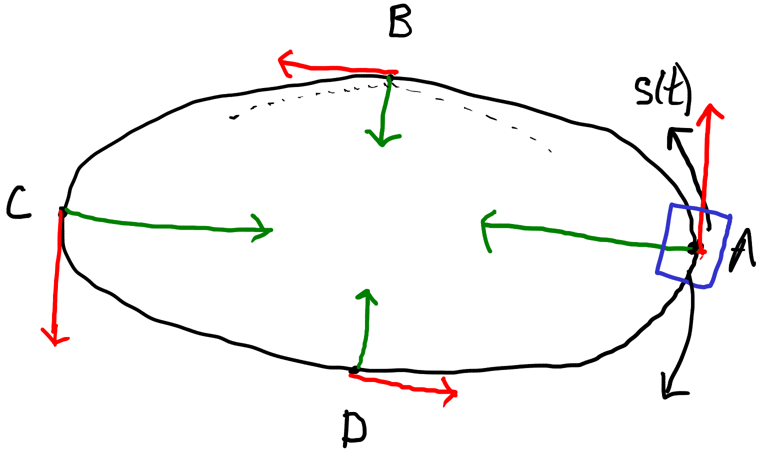
speed is slowing down (decreasing)



$\vec{v}$: still tangent to the path

magnitude is decreasing

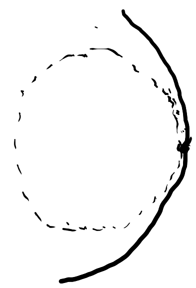
$\vec{a}$:



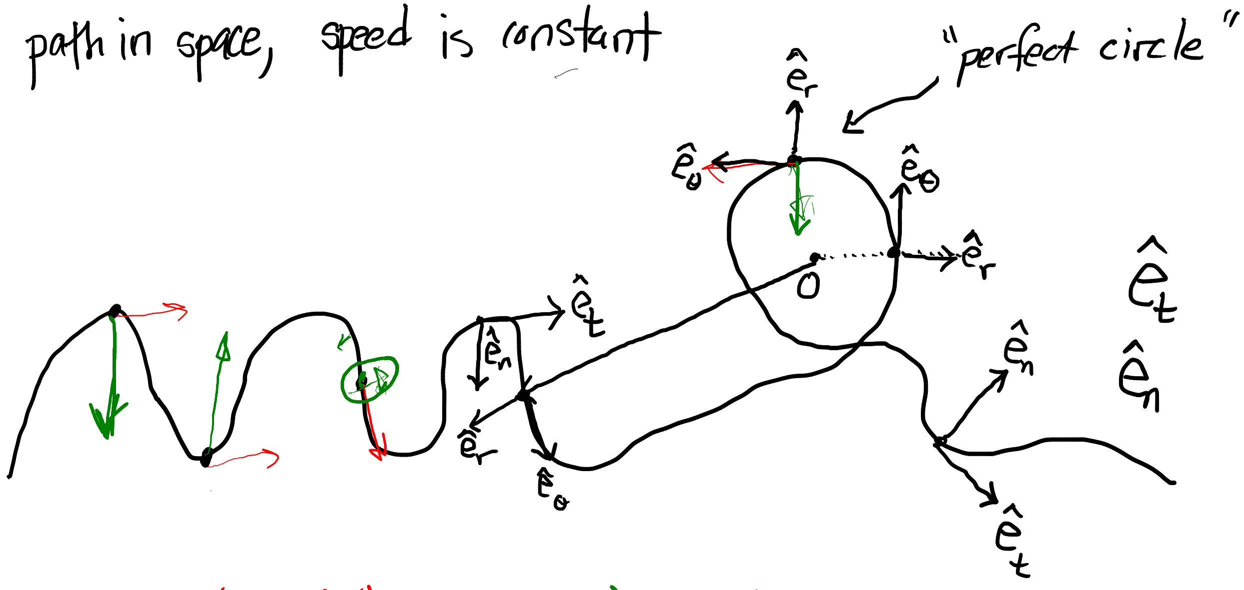
constant speed $\dot{s}$

$\vec{v}$ = tangent to path
constant magnitude

$\vec{a}$ = normal to path

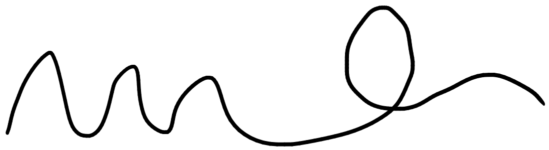


path in space, speed is constant



$\vec{v}$ = velocity

$\vec{a}$ = acceleration



path

$s(t)$ = arclength

constant speed $\dot{s}$

$$\vec{v} = (\dot{s})\,\hat{e}_t$$

magnitude, a.k.a. speed

direction

$\vec{v} = \dot{s}\,\hat{e}_t$

$\boxed{\text{constant speed } \dot{s}}$

$$\vec{a} = \frac{d\vec{v}}{dt} = \frac{d}{dt}\left(\dot{s}\hat{e}_t\right)$$

$$= \ddot{s}\,\hat{e}_t + \dot{s}\,\frac{d}{dt}(\hat{e}_t)$$

This is a vector.

It is A. parallel to $\hat{e}_t$

B. perpendicular