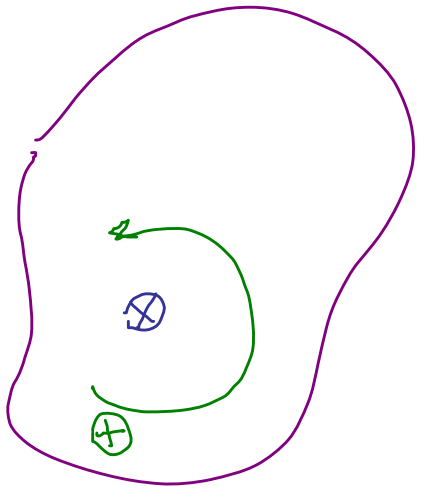
Phys 2110-5 10/26/12

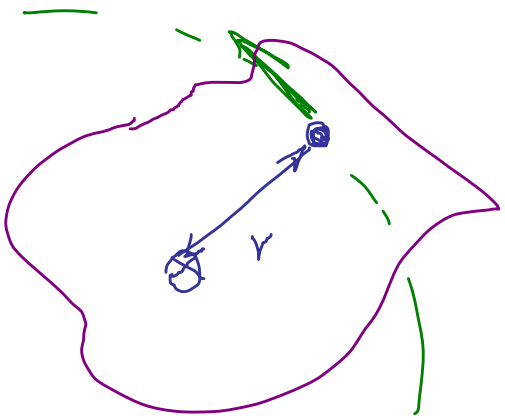
Note Title 10/26/2012



$\theta(t)$

$\omega(t) = \frac{d\theta}{dt}$

$\alpha(t) = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$



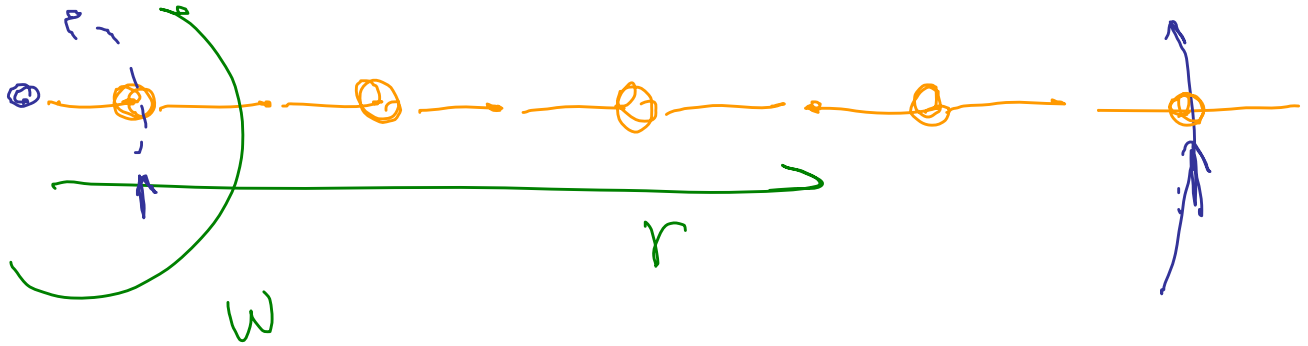
$v = v_t = r\omega$ speed of that particular point

$a_c = r\omega^2$

$a_t = r\frac{d\omega}{dt} = r\alpha$

All points have same ω, α

v is diff for diff points



$v = rw$

v, a_c, a_t "linear" quantities

θ, w, α angular.

θ, w, α

Special case α = constant

Reason for ang accel Forces
→ torque.
→ ang accel.

$\alpha = \text{const} = \frac{d\omega}{dt}$

Integrate

$$\omega = \alpha t + C$$

C ← Value of ω at $t = 0$

$C = \omega_0$

$$\boxed{\omega = \omega_0 + \alpha t}$$

θ_0 = initial value of angle often $\theta_0 = 0$

ω_0 = initial ang velocity.

$\omega = \frac{d\theta}{dt}$

$$\boxed{\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2}$$

Another one: (Sam shew)

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$v^2 = v_0^2 + 2a(x - x_0)$

10.15 Express in $\frac{rad}{s}$:

a) 720 rpm

$$720 \frac{rev}{min}\left(\frac{2\pi\ rad}{1\ rev}\right)\left(\frac{1\ min}{60\ s}\right) = 75.4\ s^{-1} = 75.4 \frac{rad}{s}$$

b) $50^\circ/_h = \frac{50\ deg}{hr}\left(\frac{\pi\ rad}{180\ deg}\right)\left(\frac{1\ hr}{3600\ s}\right) = 2.42 \times 10^{-4} \frac{rad}{s}$

d) $\left(1\ \frac{\text{rev}}{\text{year}}\right)\left(\frac{2\pi\ \text{rad}}{1\ \text{rev}}\right)\left(\frac{1\ \text{year}}{365.25\ \text{days}}\right)\left(\frac{1\ \text{day}}{86400\ \text{s}}\right) =$

$= 2\times10^{-7}\ \frac{\text{rad}}{\text{s}}$

10.18