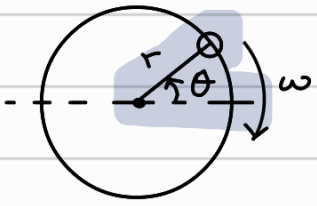
CH 5 Circular Motion.

Circular Motion:

→ Bodies moving in a circular path around a reference point.

→ Also called Angular motion.



Angular Displacement.

→ Angle swept by the radius vector of the body.

→ SI unit radians $\pi rad = 180°$.

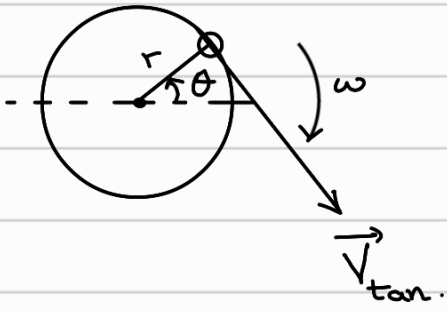
(Mathematical definition): $S = r\theta$.

Angular Velocity & Acceleration.

→ Time rate of change of Angular displ.

$$\vec{\omega}_{inst} = \lim_{\Delta t \to 0} \frac{\Delta\theta}{\Delta t}$$

$$V_{tan} = r\omega.$$



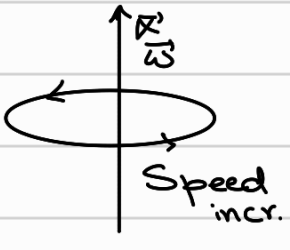
Angular accel.:

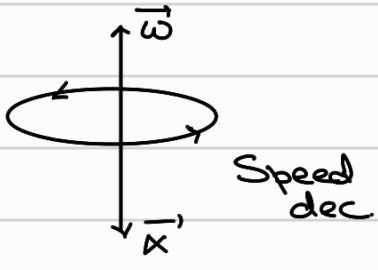
→ Rate of change of angular velocity.

$$\vec{\alpha} = \frac{\Delta\vec{\omega}}{\Delta t}$$

tangential accel.: $\frac{\Delta V_{tan}}{\Delta t} = \frac{r\Delta\omega}{\Delta t}$

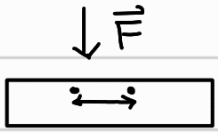
$$a_{lin} = r\alpha.$$

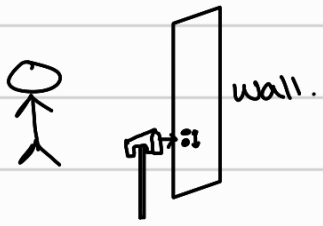




Rigid Body.

→ Maintains uniform dist. b/w its two consecutive points when a load is applied.





Centripetal Force. (Centre seeking).

→ Not really a particular force.

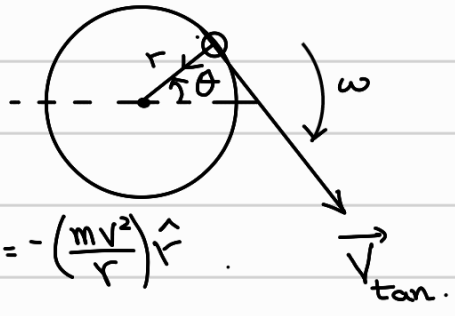
→ Resultant of all forces.

Centripetal accel.:

Assumption:

→ $v_{object} = \text{Const.} \Rightarrow \vec{a}_{tan} = 0$ $\quad W = F \cdot S$

$$\vec{a} = \frac{\Delta \vec{V}}{\Delta t}\hat{a}_t + \frac{v^2}{r}\hat{a}_r.$$



$$\vec{F} = m\vec{a} = -mr\omega^2\hat{r} = -m\vec{r}\omega = -\left(\frac{mv^2}{r}\right)\hat{r}.$$

☆ Workdone by centripetal force is zero.

Moment of Inertia.

→ Measure of hinderance offered by a ridgid body against angular motion, when torque acts on it.