MOTION In 1-D

① Displacement / Distance on circular path

$\boxed{Disp^m = 2R\sin\left(\frac{\theta}{2}\right)}$ $\boxed{dist = R\theta}$

② Average speed

a) same time interval

$\boxed{Sp_{avg} = \frac{V_1+V_2}{2}}$

$t_1 = t_2 = t$

b) same dist

$\boxed{V_{avg} = \frac{2V_1V_2}{V_1+V_2}}$

$x = x_1 = x_2$

$\boxed{V_{avg} = \frac{V_1t_1 + V_2t_2}{t_1+t_2}}$

$\boxed{V_{avg} = \frac{x_1+x_2}{\frac{x_1}{V_1}+\frac{x_2}{V_2}}}$

③ Speed

a) Inst $\boxed{S_{ins} = \frac{dx}{dt}}$

b) Avg $\boxed{S_{avg} = \frac{\int S\,dt}{\int dt}}$

For uniform motion:- $\boxed{S_{avg} = S_{inst}}$

④ Velocity

a) Inst $\boxed{\vec{v}_{ins} = \frac{d\vec{x}}{dt}}$ → slope of x-t graph

b) Avg $\boxed{V_{avg} = \frac{\int v.dt}{\int dt}}$

• on circular path; $\boxed{V_{avg} = \frac{V\sin(\theta/2)}{(\theta/2}}$

Velocity uniform = speed must be uniform.

Velocity variable = speed may/may not be

Speed uniform = velocity may be

Speed variable = velocity must variable

⑤ Acceleration

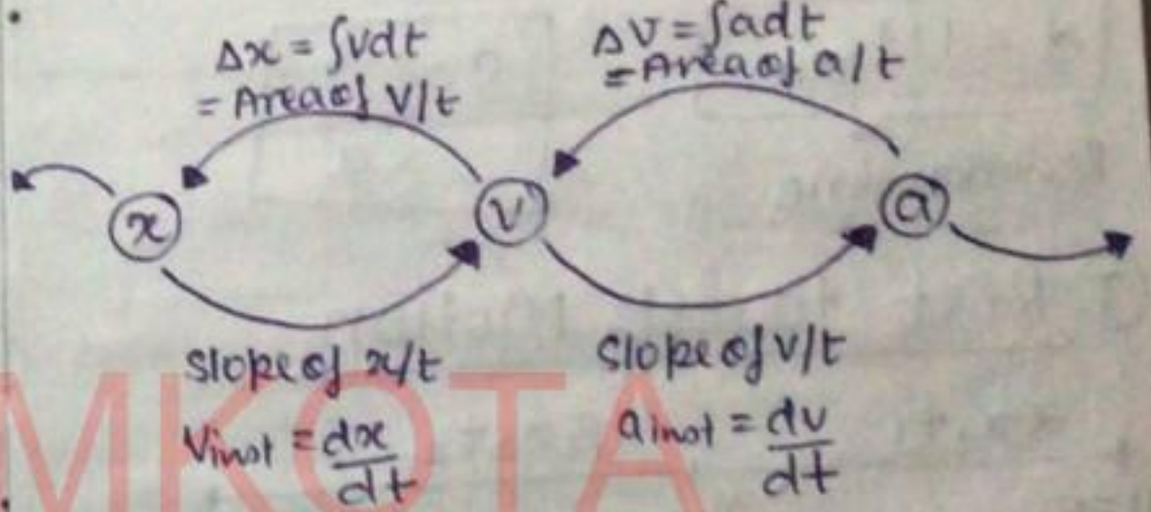
$\boxed{\vec{a}_{inst} = \frac{dv}{dt} = v\frac{dv}{dx} = \frac{d^2x}{dt^2}}$

$\boxed{\vec{a}_{avg} = \frac{\vec{V}_2-\vec{V}_1}{\Delta t} = \frac{\int_{t_1}^{t_2} a_{inst}\,dt}{\int_{t_1}^{t_2} dt}}$

$\frac{d\vec{v}}{dt} = \vec{a}$ ⇒ The rate of change in velocity.

$\left|\frac{d\vec{v}}{dt}\right| = |\vec{a}|$ = Magnitude of acc

$\frac{d|\vec{v}|}{dt}$ = Rate of change in speed.



$\boxed{V \propto \sqrt{x}}$
$\boxed{V \propto t}$
$\boxed{x \propto t^2}$
const acceleration

1D me U turn ke liye rukna hoga (V = 0)

$\boxed{dist \neq disp}$

Position ke formule me time ke dono term ko dekho agar dono term +, +ya −, − sign rakhta hai to U turn nai lenge (dist = disp^m)

Agar sign +, − hai to U turn lenge aur dist ≠ disp^m

Moving frame se body ko drop/release karne par frame ka velocity share hota hai acc^n nhi

$\boxed{S_{nth} = U + \frac{a}{2}(2n-1)}$ → const acc^n not

$\boxed{\frac{S_{nth}}{S_n} = \frac{2n-1}{n^2}}$ or

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