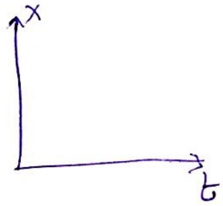
Motion in a straight lines

- **Displacement** = $\Delta X = X_2 - X_1$ vector quantity
  - Magnitude = $|\Delta X|$
  - has 2 features: → direction, → Magnitude

- **Distance Travelled**: measured along the actual path

- **Average velocity & Average speed**
  - (vector) velocity = $\frac{\Delta X}{\Delta t}$ (ΔX → pos → V+, neg → V−; Δt → always +)
  - avg speed = $\frac{distance}{\Delta t}$ (scalares) → no algebric sign $= \frac{d_1 + d_2}{t_1 + t_2}$

velocity in a graph = The slope of the line That connects 2 points (x_1, t_1 and x_2, t_2)



V.I.N: our bodies reacts to accelerations but not to velocities

- **Instantaneous velocity and speed**

$V_{Inst} = \frac{dx}{dt}$ The slope of $x(t)$ curve at that point

sign of $\vec{V}$ and $\vec{a}$ the same → acceleration

- vector **Average Acceleration**

$acc = \frac{\Delta V}{\Delta t}$ = slope

$acc_{Inst} = \frac{dv}{dt}$ = slope at that point

$\Delta X \rightarrow V \rightarrow acc$ اشتقاق

$acc \rightarrow V \rightarrow \Delta X$ تكامل

Physics of Motion
- Kinematics: describes change in motion
- Dynamics outline The effect

Motion: Translation, Vibaration, Rotation

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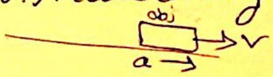
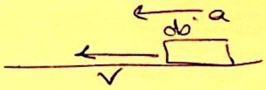
Acceleration

a +
v +
Speed : Increases
Motion : Accelerating

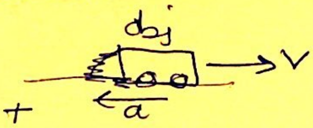


a -
v -
Speed: Increases
Motion : Acceleration

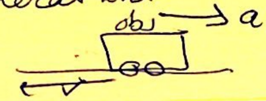


Deceleration

a -
v +
Speed : decreases
Deceleration

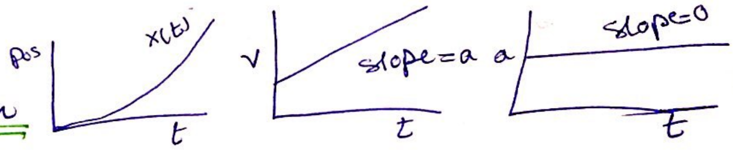


a +
v -
Speed: decreases
Deceleration.



* THe Human body has an awarness of acceleration But not The velocity

Constant acceleration



$$\bar{a} = \frac{V_2 - V_1}{t_2 - 0}$$

$$V_2 - V_1 = a t_2$$

$$\boxed{V_2 = V_1 + a t_2}$$ 1 we us This if we don't have $\Delta X (X - X_0)$

$$\bar{V} = \frac{V_1 + V_2}{2}$$

$$= \frac{V_1 + V_1 + at}{2}$$

$$\boxed{\bar{V} = V_1 + a\left(\frac{t}{2}\right)}$$

Const acc

$$\boxed{\bar{V} = \frac{V_1 + V_2}{2}}$$ 2

ΔV a-t ~ ~ ~
ΔX : المساحة تحت منحنى
$V - t$
$= \Delta V \cdot t$

$$\Delta X = \bar{V} t = \left(\frac{V_1 + V_2}{2}\right)\left(\frac{V_2 - V_1}{a}\right)$$

$$\Delta X = \frac{V_1^2 + V_2^2}{2a}$$

$$\boxed{V_2^2 = V_1^2 + 2a\Delta X}$$ 4 ~ ~ ~ ~ ~ ~ t

$$\Delta X = \bar{V} t$$

$$= \frac{1}{2}(V_1 + V_1 + at)t$$

$$\boxed{\Delta X = V_1 t + \frac{1}{2} a t^2}$$ 3 ~ ~ ~ V_2

$\frac{V_1 + V_2}{2}$

Variable account

Acceleration $\longrightarrow$ velocity $\longrightarrow$ position

$\frac{dv}{dt} = a(t)$ $\quad \int a(t)$ $\quad \cdot V(t)$ $\quad \int v(t)$ $\quad X(t)$

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