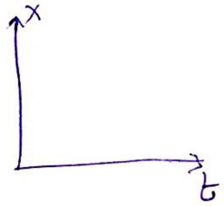
Motion in a straight lines

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

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

- **Average velocity & Average speed**
  - (vector) velocity $= \frac{\Delta X}{\Delta t}$; ΔX: pos → V+, neg → V−; Δt → always +
  - speed$_{avg}$ $= \frac{distance}{\Delta t}$ (scalars) → 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

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

Motion
- Translation
- Vibration
- Rotation

vector • **Average Acceleration**

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

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

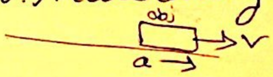
$\Delta X \rightarrow V \rightarrow acc$ اشتقاق

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

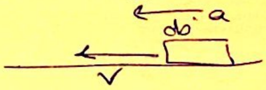
Alaa Etaimi

Acceleration

a +
v +
Speed : Increases
Motion : Accelerating



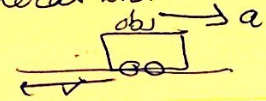
a -
v -
Speed: Increases
Motion : Acceleration



Deceleration

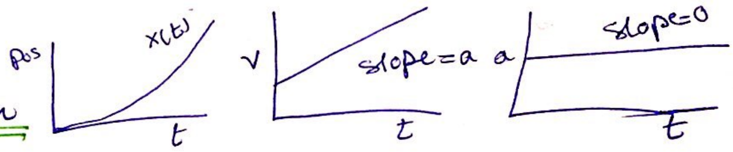
a -
v +
Speed : decreases
Deceleriation

a +
v -
Speed: decreases
Deceleration.



* THe Humain body has an awarness of acceleratio
But not The velocity

Contant acceleration



$$\bar{a} = \frac{v_2 - v_1}{t_2 - 0}$$

$$v_2 - v_1 = at_2$$

$$\boxed{v_2 = v_1 + at_2}$$

1 we us This if we don't have $\Delta x\,(x - x_0)$

Const acc

$$\boxed{\bar{v} = \frac{v_1 + v_2}{2}}$$ 2

Δv a-t ~ ~ ~
Δx : المساحة تحت منحنى
v-t
$= \Delta v \cdot t$

$$\bar{v} = \frac{v_1 + v_2}{2}$$

$$= \frac{v_1 + v_1 + at}{2}$$

$$\boxed{\bar{v} = v_1 + a\left(\frac{t}{2}\right)}$$

$$\Delta x = \bar{v}t = \left(\frac{v_1 + v_2}{2}\right)\left(\frac{v_2 - v_1}{a}\right)$$

$$\Delta x = \frac{v_1^2 - v_2^2}{2a}$$

$$\boxed{v_2^2 = v_1^2 + 2a\Delta x}$$ 4 ~ ~ ~ ~ $\tilde{t}$

$$\Delta x = \bar{v}t$$

$$= \tfrac{1}{2}(v_1 + v_1 + at)t$$

$$\boxed{\Delta x = v_1 t + \tfrac{1}{2}at^2}$$ 3 ~ ~ ~ v_2

$\frac{v_1 + v_2}{2}$

Variable account

Acceleration $\xrightarrow{\int a(t)}$ velocity $\cdot v(t)$ $\xrightarrow{\int v(t)}$ position $x(t)$

$\frac{dv}{dt} = a(t)$

Alaa Etaiwi