IF WE WANT TO …. → DIFFERENTIATE (FIND THE DERIVATIVE) → THEN WE MUST TO: → 1. SUBTRACT (FIND $x - x_0 = \Delta x$) AND $t - t_0 = \Delta t$ THEN 2. DIVIDE $\frac{\Delta x}{\Delta t}$, AND FINALLY

3. FIND THE LIMIT OF THE OBTAINED → RATIO : $\lim\limits_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$ DIFFERENTIALS

WE ARE APPLYING THE OPERATOR OF TIME DERIVATIVE $\frac{d}{dt}$

TO THE COORDINATE $x(t)$

IN THE PROCESS IN WHICH Δt DECREASES TO ZERO…..

FINITE TIME INTERVAL

INFINITELY SMALL TIME INTERVAL

IF WE WANT TO… → INTEGRATE (FIND THE INTEGRAL) → THEN WE MUST TO: → 1.MULTIPLY [FIND $v(t) \cdot \Delta t$] THEN 2. ADD $\sum_{i=0}^{n} v(t_i) \cdot \Delta t$ OR FIND THE SUM

3. FIND THE LIMIT OF THE OBTAINED → SUM : $\lim\limits_{\substack{\Delta t \to 0 \\ n \to \infty}} \sum_{i=0}^{n} v(t_i) \cdot \Delta t = \int_0^{t'} v(t) \cdot dt$

INTEGRATION IS THE SAME AS ADDITION BUT THE ADDITION OF ENDLESS NUMBER OF PRODUCTS THAT ARE INFINITELY SMALL.

$\frac{d}{dt}$ „COORDINATE“ = „VELOCITY“ OF THE CHANGE THIS „COORDINATE“

$\int_0^{t^i}$ "VELOCITY" $\cdot dt$ = CHANGE OF THE „ COORDINATE“ DURING THE TIME INTERVAL $\Delta t = t' - 0$

WE ARE APPLYING THE OPERATOR OF THE DEFINED INTEGRAL OVER TIME t $\int_0^{t'} \ldots \cdot dt$

TO THE VELOCITY $v(t)$

$v = v_0 + at$ $\xrightarrow{\text{DIFFERENTIATION GIVES}}$ a

$x = x_0 + v_0 t^1 + \frac{at^2}{2}$ $\xrightarrow[\text{GIVES}]{\text{DIFFERENTIATION}}$ $v_0 + at$

BY THE DIFFERENTIATION THE EXPONENT DECREASES BY 1 AND THE NEW POWER FUNCTION SHOULD BE MULTIPLIED BY OLD EXPONENT

$\frac{d}{dt}(t^2) = 2t^1 \qquad \frac{a}{2} \cdot 2t^1 = at \qquad \frac{d}{dt}(v_0 t^1) = v_0 t^0 = v_0$

THE COMMON RULE: $\frac{d}{dx}[cx^n] \underset{*}{=} c \cdot nx^{n-1}$

BY THE INTEGRATION THE EXPONENT INCREASES BY 1 AND THE NEW POWER FUNCTION SHOULD BE DIVIDED BY THE NEW EXPONENT

$\int_0^{x'} cx^n dx = c \cdot \frac{x^{n+1}}{n+1} - 0 \qquad c \cdot \frac{0^{n+1}}{n+1}$

CHECK: $\frac{d}{dx}\left[c\frac{x^{n+1}}{n+1}\right] = c(n+1)\frac{x^{(n+1)-1}}{n+1} = c \cdot x^n$

WE GET THE INITIAL FORM OF THE FUNCTION [.....]