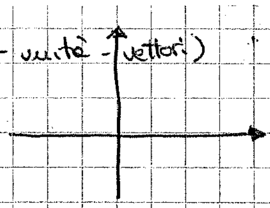
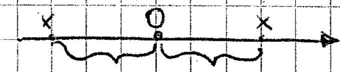
BASI FISICA (grandezze - unità - vettori)
MOTO RETTILINEO.





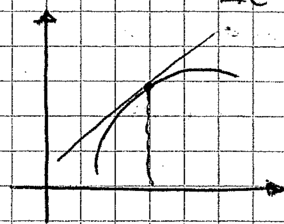
$d: |x_1 - x_0|$

legge oraria $x(t)$

$v(t) = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \dot{x} = x'$

derivata = $\dot{x}$; $f'(x)$; x' : $\frac{dx}{dt}$

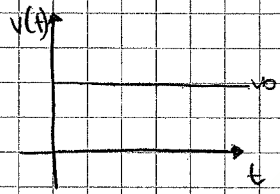
$v(t) = \lim_{\Delta t \to 0} \frac{x(t+\Delta t) - x(t)}{\Delta t} = \frac{dx}{dt}$



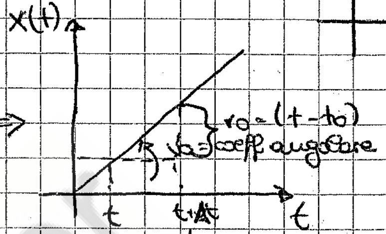
MOTO RETTILINEO UNIFORME

$v = v_0$

$v(t) = v_0$



$\Rightarrow$

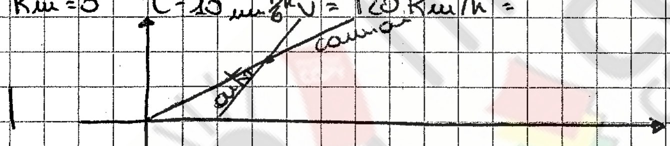


$v(t) = \frac{x(t+\Delta t) - x(t)}{\Delta t} \rightarrow x(t+\Delta t) = x(t) + \Delta t\, v_0$

$$\boxed{x(t) = x(t_0) + (t - t_0) \cdot v_0}$$

camion Km = 0 $t = 0$ $v = 90$ Km/h = 23,3 m/s dove e quando e' l'auto supera?

auto Km = 0 $t = 10$ min $\frac{1}{6}$h $v = 120$ Km/h =



90 : 36 = 23,3 ; 78 ; 120 ; 108 ; = 120

1200 : 36 = 33,3 ; 12

$t = 10 \cdot 60 = 600\,s \rightarrow S = \Delta t \cdot v = 600 \cdot 23{,}3 = 13\,980$

23,3 · 600 = 000 ; 000 ; 1398 ; 13980

$$\begin{cases} x_c(t) = v_c \cdot t \\ x_A(t) = 0 + v_A(t - t_A) \end{cases} \Rightarrow v_C\, t = v_A(t - t_A)$$

$t_I = \frac{v_A t_A}{v_A - v_C} = \frac{33{,}3 \cdot 10}{33{,}3 - 23{,}3} = \frac{33{,}3 \cdot 10}{10} = \frac{20\,Km}{30\,Km/h} = \frac{2}{3}h = 40$ min

$x_I = \frac{v_A t_A}{v_A - v_C}$

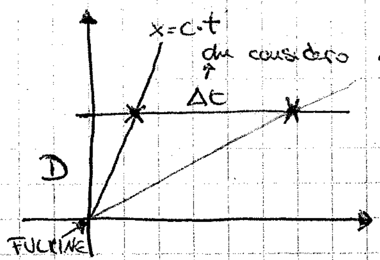
$S_c = \frac{2}{3} \cdot 90 = 60$ Km

$S_a = \left(\frac{2}{3} - \frac{1}{6}\right) \cdot 120$ Km =

FULMINE $t=0$ $\quad$ $v = 3 \cdot 10^8\ m/s$

TUONO $t = 9\ s$ $\quad$ $v_S = 330\ m/s$

$S(s) = v(t) = 9 \cdot 330\ m$ (la velocità della luce è trascurabile perchè molto grande)



$$\begin{cases} D = c\,t_L \\ D = v_S t_S = v_S (t_L + \Delta t) \end{cases}$$

$\times$

$$\frac{c\,t_L}{c} = \frac{v_S}{c}(t_L + \Delta t) \qquad t_L = \frac{v_S}{c}(t_L + \Delta t) \quad t_L\left(1 - \frac{v_S}{c}\right) = \Delta t \cdot \frac{v_S}{c}$$

$$t_L = \frac{D}{c} \qquad t_S = \frac{D}{v_S}$$

$$\Delta t = t_S - t_L = \frac{D}{v_S} - \frac{D}{c} \quad D\left(\frac{1}{v_S} - \frac{1}{c}\right)$$

$x(t)$

$v(t) = \frac{dx}{dt}$

$v_m = \frac{\Delta x}{\Delta t} \xrightarrow[\Delta t \to 0]{} v(t)$

$a_m = \frac{\Delta v}{\Delta t} = \frac{v(t+\Delta t) - v(t)}{\Delta t}$

$[v] = L \cdot T^{-1}$

$[a] = L \cdot T^{-2}$ m/s^2 $Km/h \cdot s$

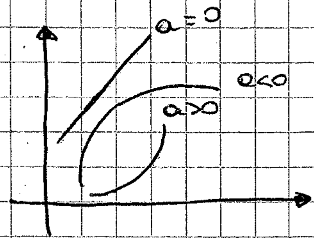
accelerometri

ACCELERAZIONE $g = 9,81\ m/s^2$

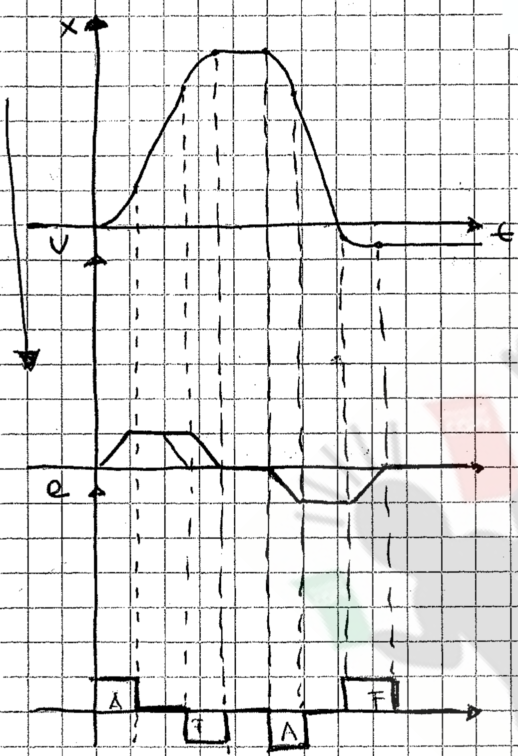
$a(t) = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$ retta tangente

$\Rightarrow a(t) = \frac{d^2x}{dt^2}$

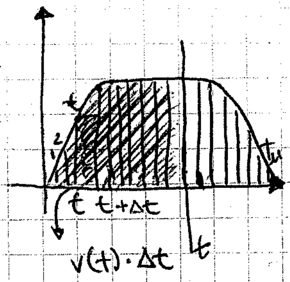
$v(t) = \frac{dx}{dt}$



se il grafico è retta $v = dt$ $a = 0$



conosciamo $v(t)$



$$v(t) = \frac{\Delta x}{\Delta t} \qquad \Delta x = v(t) \cdot \Delta t$$

t_0

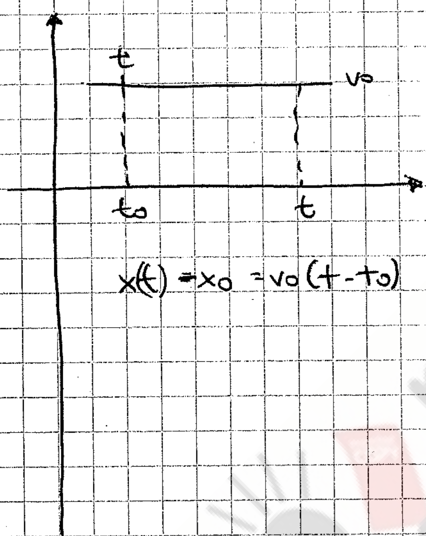
$$x(t) = x_0 + (x_1 - x_0) + (x_2 - x_1) + \ldots + (x_n - x_{n-1})$$

$$x(t) = v(t_0)(t_1 - t_0) + v(t_1)(t_2 - t_1)$$

$$x(t) = x_0 + \sum_{i=1}^{n-1} v_i(t_i)(t_{i+1} - t_i) = x_0 + \int_{t_0}^{t} v(t)\,dt$$

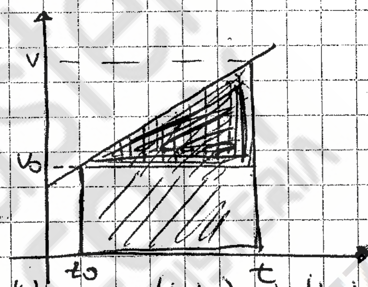
(x_0) costante arbitraria d'integrazione

$v = v_0$



$$x(t) - x_0 = v_0(t - t_0)$$

$$x(t) - x_0 = v_0(x - t_0)$$



$$x(t) = x_0 + v_0(t - t_0) + \frac{1}{2}(t - t_0)(v - v_0)$$

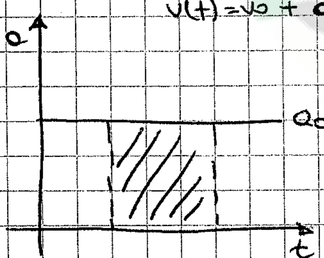
$$v(t) = v_0 + \int_{t_0}^{t} a(t)\,dt \qquad \frac{1}{2} a_0 (t - t_0)^2$$

UNIFORMEMENTE ACCELERATO

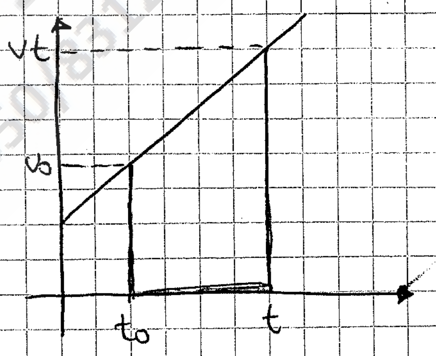
$a(t) = a_0$

$$v(t) = v_0 + a_0(t - t_0)$$

$$v(t) = x_0 + v_0(t - t_0) + \frac{1}{2} a_0 (t - t_0)^2$$



~~x(t) = x0 +~~



$$a_0 = \frac{v - v_0}{t - t_0}$$

$$x(t) - x_0 = \frac{1}{2}(v_0 + v(t)) \cdot (t - t_0)$$

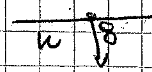
$$x(t) - x_0 = \frac{1}{2} \frac{(v_0 + v(t))}{(t - t_0)} (t - t_0)^2$$

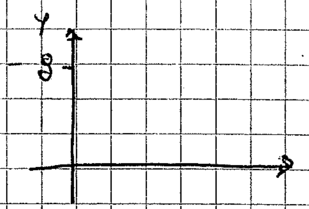
$$(t - t_0)\left[v_0 + \frac{1}{2} v - \frac{1}{2} v_0\right]$$

$$\frac{1}{2}(t - t_0)\left[v_0 + v(t)\right]$$

$$\begin{cases} x(t) = x_0 + v_0(t-t_0) + \frac{1}{2} a_0 (t-t_0)^2 \\ v(t) = v_0 + a_0(t-t_0) \end{cases}$$

→ studio nel campo gravitazionale

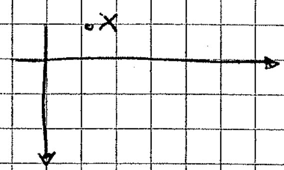




$y(t) = h + 0 + \frac{1}{2}(-g)(t)^2$

$t : y = 0$

FORZE → a



$x(t) = 0 + 0 + \frac{1}{2} g t^2$

$t : x = \sqrt{\frac{2h}{g}}$

$x(t) = x_0 + v_0(t-t_0) + \frac{1}{2} a_0 (t-t_0)^2$

$v(t) = a_0(t-t_0)$

$a(t) = a_0$

CADUTA DEI GRAVI

$t = \sqrt{\frac{2h}{g}}$

se conosco t $\quad v(t) = v_0 + a_0(t-t_0)$

se conosco s

$$\begin{cases} s = v_0(t) + \frac{1}{2} a_0 (t)^2 \\ v = v_0 + a_0(t) \end{cases} \qquad t = \frac{v - v_0}{a_0}$$

⇓

$$s = v_0\left(\frac{v - v_0}{a_0}\right) + \frac{1}{2} a_0 \frac{(v-v_0)^2}{(a_0)^2}$$

$a_0 s = \cancel{v_0 v} - v_0^2 + \frac{1}{2}(v^2 - \cancel{2 v v_0} + v_0^2)$

$a_0 s = \frac{1}{2} v^2 - \frac{1}{2} v_0^2$

$v^2 - v_0^2 = 2 a_0 s \qquad v^2 = 2gh$