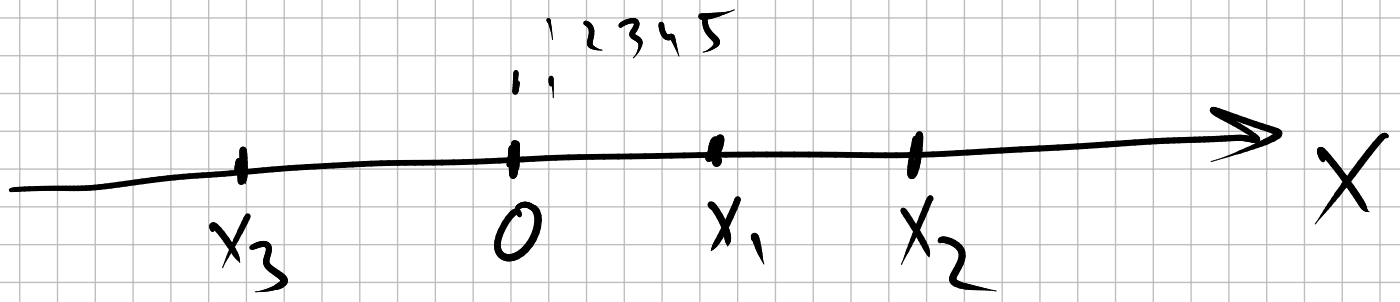


Position $\longleftrightarrow$ x could be < 0
we need units

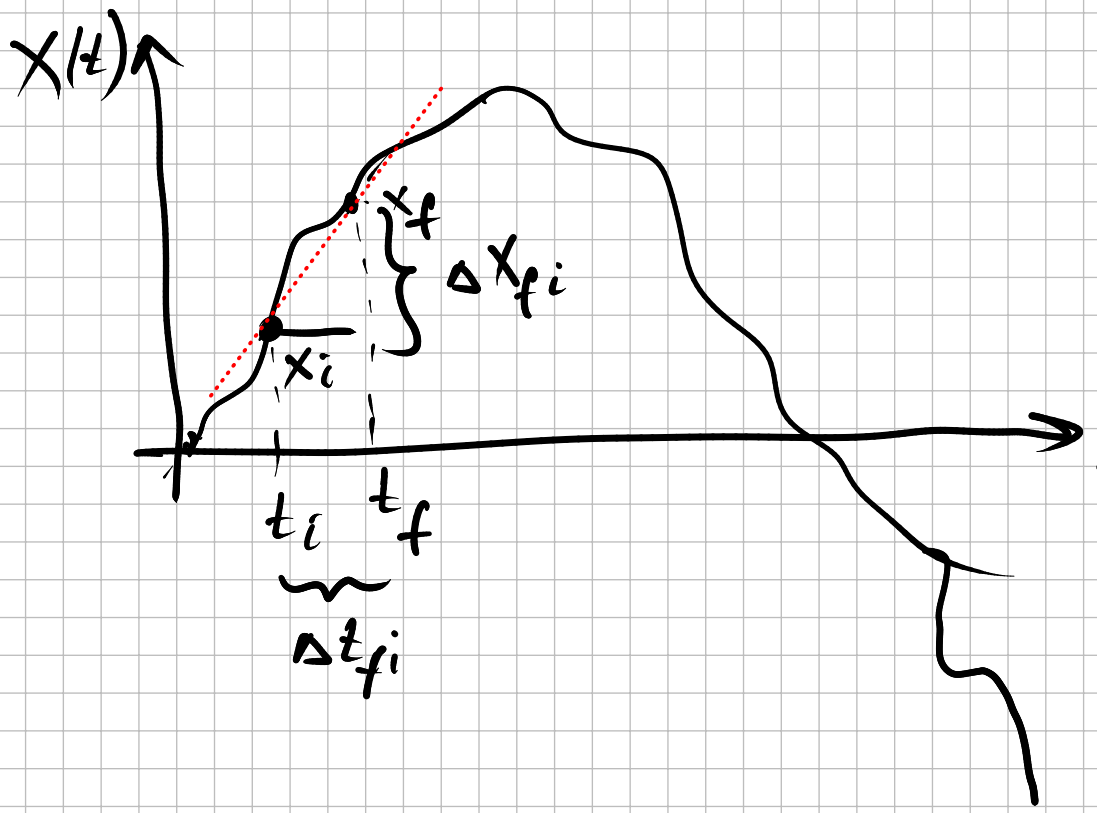
distance is not position, ≥ 0

displacement

$$\Delta x_{21} = x_2 - x_1 \longleftrightarrow \text{distance} \quad d_{21} = |\Delta x_{21}|$$

$$x_{fi} = x_f - x_i \qquad d_{fi} = |\Delta x_{21}| + |\Delta x_{32}| + |\Delta x_{43}| + \cdots + |\Delta x_{fN}|$$

Position vs time



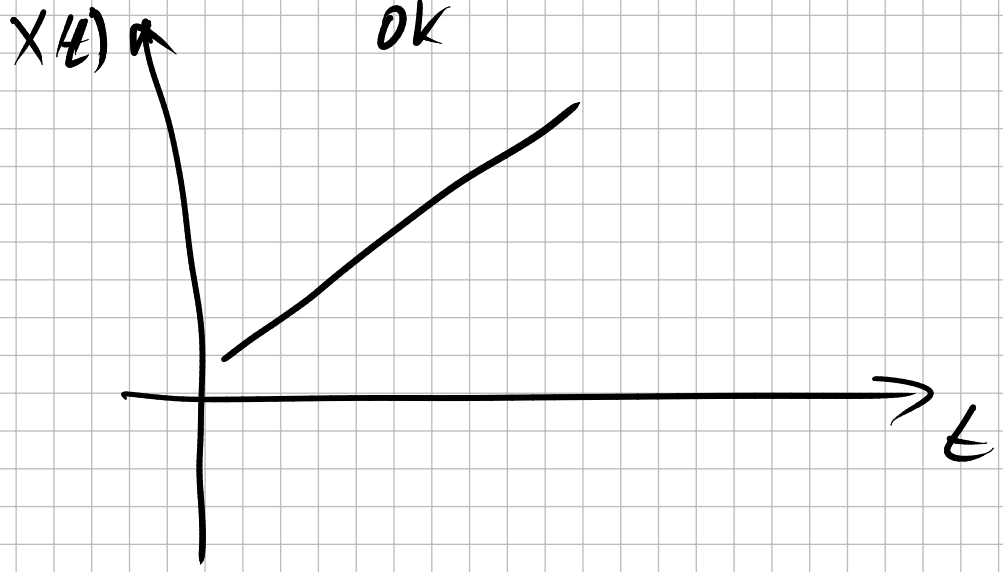
average velocity

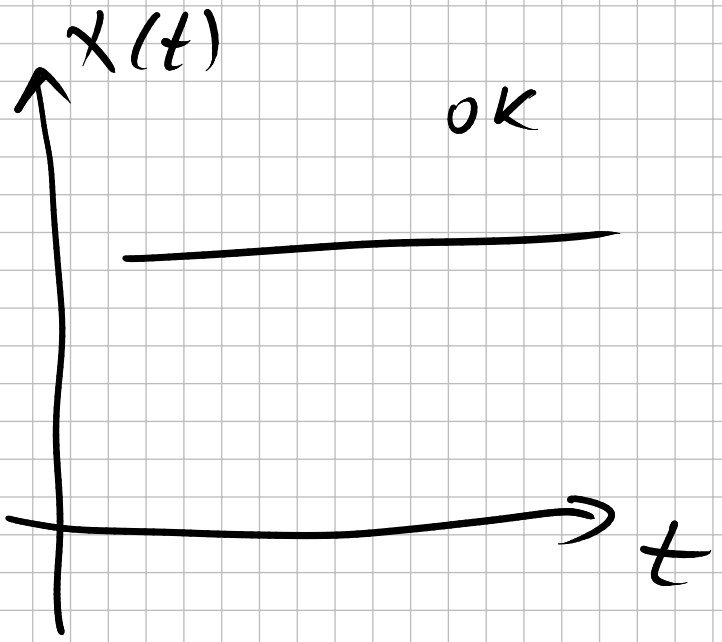
$$v_{fi} = \frac{\Delta x_{fi}}{\Delta t_{fi}} \xrightarrow{\Delta t_{fi} \to 0} v(t) = \frac{dx}{dt}$$

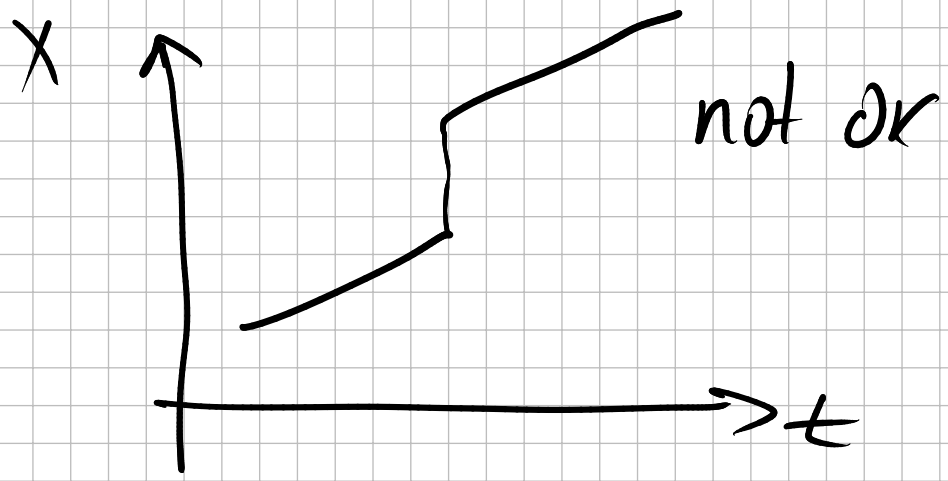
instant velocity

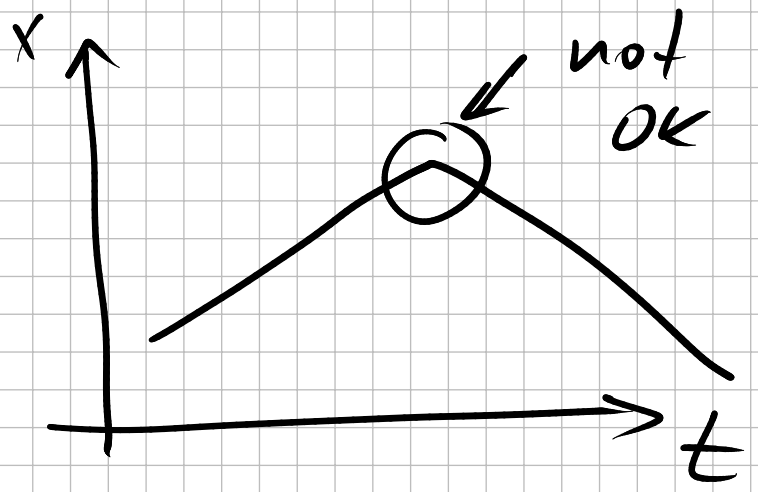
speed

$$s = |v(t)|$$


X(t)
ok
t


X(t)
ok
t


X
not ok
t


x
not
ok
t

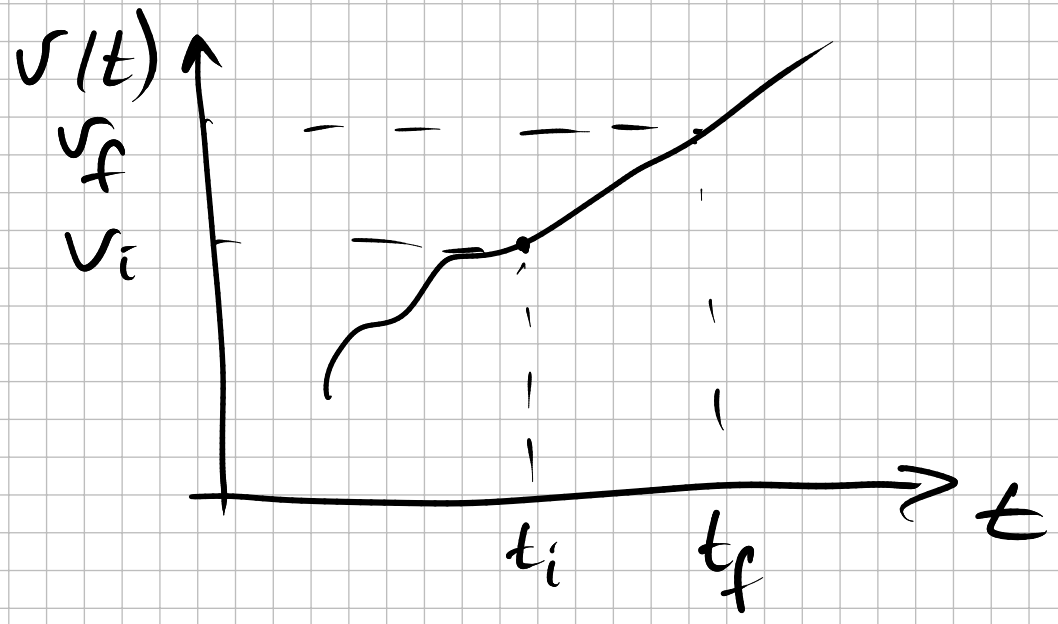
if velocity is constant then

$$x_f = x_0 + v \cdot (t_f - t_0) = x_0 + v t_f$$

(x_0: initial)

if $t_0 = 0$

acceleration



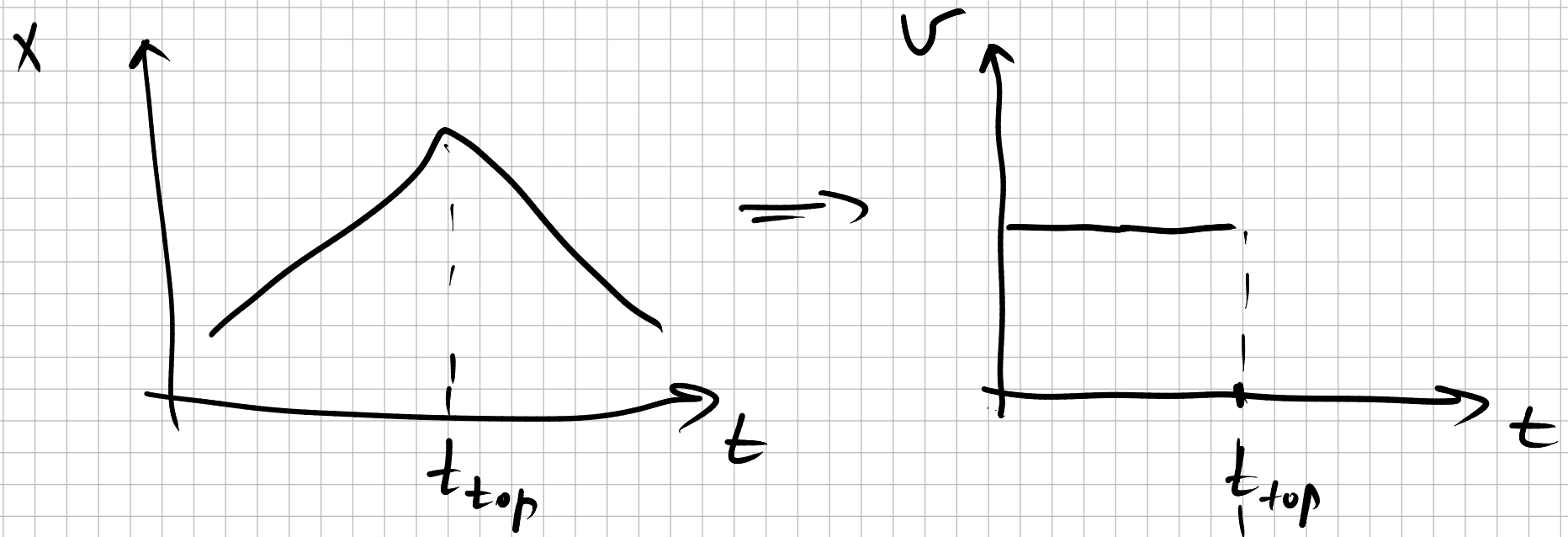
averaged

$$a_{fi} = \frac{\Delta v_{fi}}{\Delta t_{fi}} = \frac{v_f - v_i}{t_f - t_i}$$

$(t_f - t_i) \to 0$

$$= a = \frac{dv}{dt}$$

(instant)

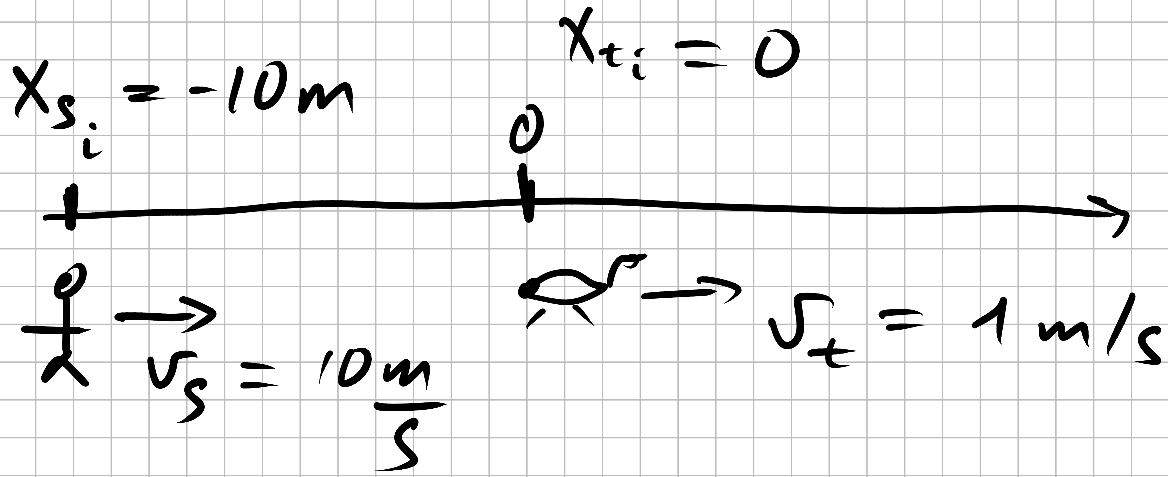


if $a = const$

$$x_f = x_0 + v_0 \cdot t_f + \frac{a t_f^2}{2}$$

$t_i = t_0 = 0$ ← hidden assumption

$$x_f = x_0 + \frac{(v_f^2 - v_0^2)}{2a}$$



$$x_{t_f} = x_{t_0} + v_t \cdot t_f \quad (x_{t_0} = 0)$$

$$\parallel$$

$$x_{s_f} = x_{s_i} + v_s \cdot t_f$$

$$t_f = \frac{x_s}{v_t - v_s} = \frac{-10}{1-10}$$

$$= \frac{-10}{-9} = 1.\cancel{11111}$$

no! significant