$$\boxed{a = -kv}$$ $k > 0$ (k = costante)

$$[k] = \left[\frac{a}{v}\right] = \frac{m/s^2}{m/s} = s^{-1}$$

$$\left.\begin{aligned} a &= \frac{dv}{dt} \\ a &= -kv \end{aligned}\right\} \Rightarrow \frac{dv}{dt} = -kv$$

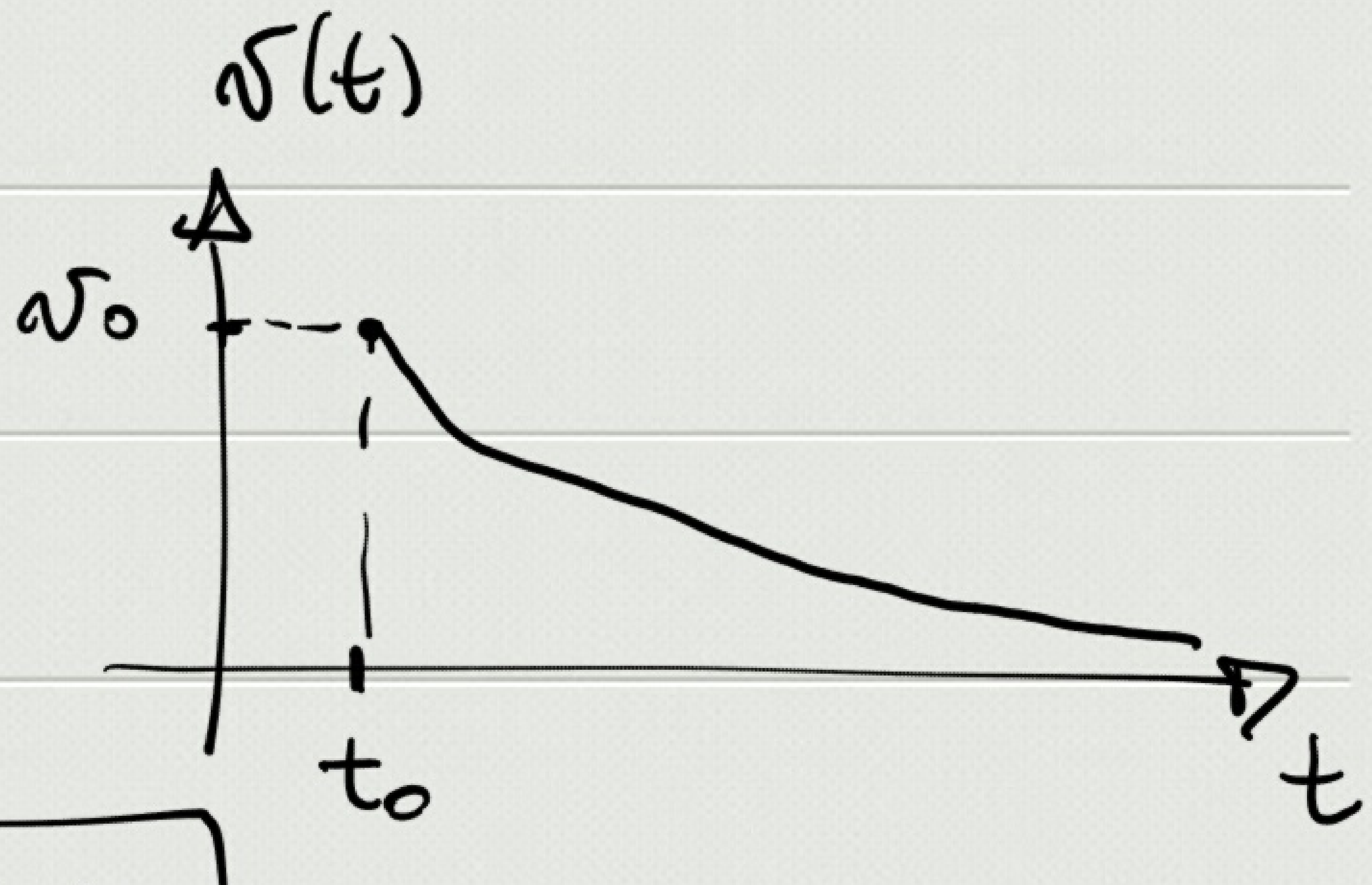
$$\Rightarrow \frac{dv}{v} = -k\,dt \Rightarrow \int_{v_0}^{v(t)} \frac{dv}{v} = -k \int_{t_0}^{t} dt$$

$$\ln v \Big|_{v_0}^{v(t)} = -k(t - t_0)$$

$$\Rightarrow \ln v(t) - \ln v_0 = -k(t - t_0)$$

$$\ln \frac{v(t)}{v_0} = -k(t - t_0)$$

$$\frac{v(t)}{v_0} = e^{-k(t - t_0)}$$



$$\Rightarrow \boxed{v(t) = v_0\, e^{-k(t - t_0)}}$$

$$v(t) = \frac{dx}{dt} \Rightarrow \int_{x_0}^{x(t)} dx = \int_{t_0}^{t} v(t)\, dt \Rightarrow$$

$$\Rightarrow x(t) = x_0 + \int_{t_0}^{t} v_0 e^{-k(t-t_0)} dt =$$

$$= x_0 + v_0 \left(-\frac{1}{k}\right) e^{-k(t-t_0)} \Big|_{t_0}^{t} =$$

$$= x_0 - \frac{v_0}{k}\left[e^{-k(t-t_0)} - 1\right] =$$

$$\Rightarrow \boxed{x(t) = x_0 + \frac{v_0}{k}\left[1 - e^{-k(t-t_0)}\right]}$$

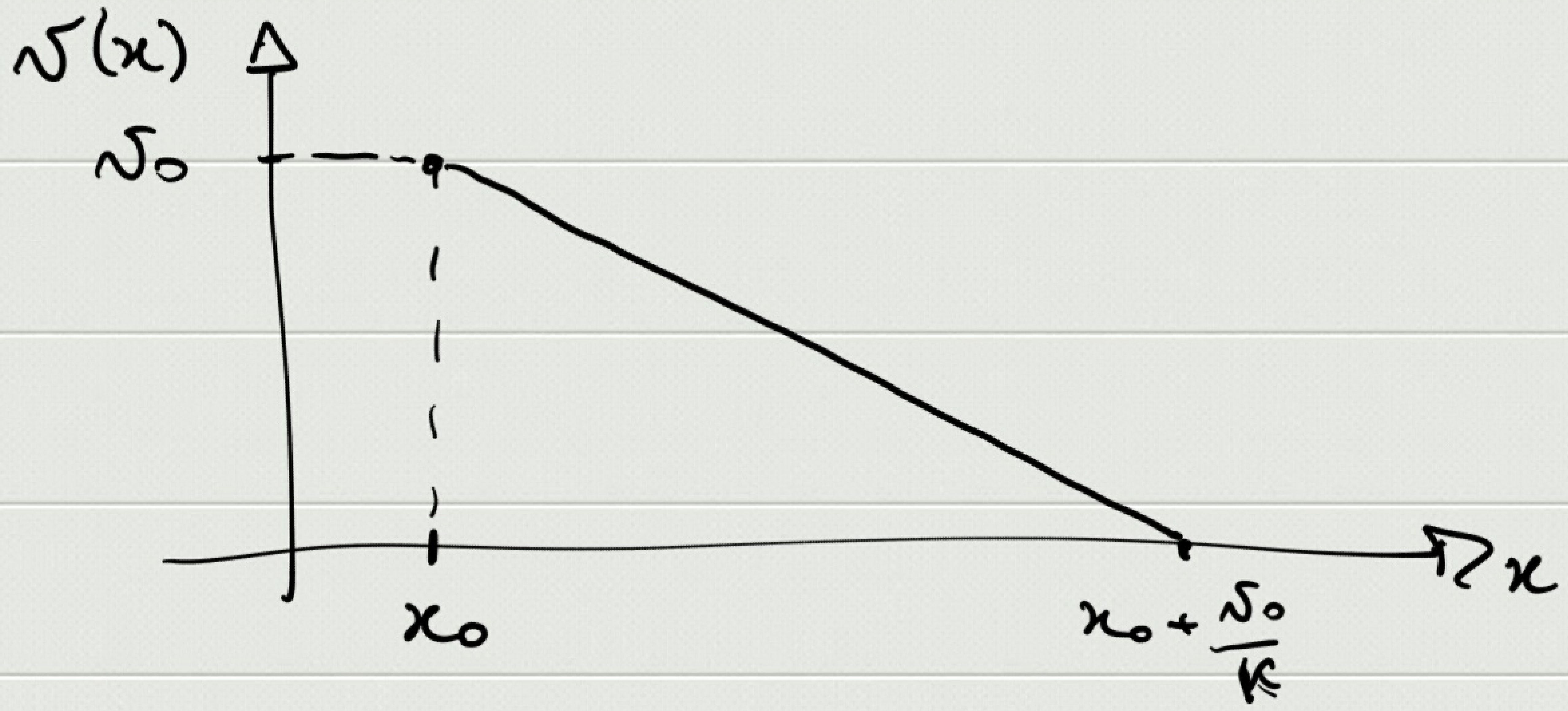
$$a = \frac{dv}{dt} = \frac{dv}{dx}\,\frac{dx}{dt} = v\,\frac{dv}{dx}$$

$$= -k\,v$$

$$\frac{dv}{dx} = -k$$

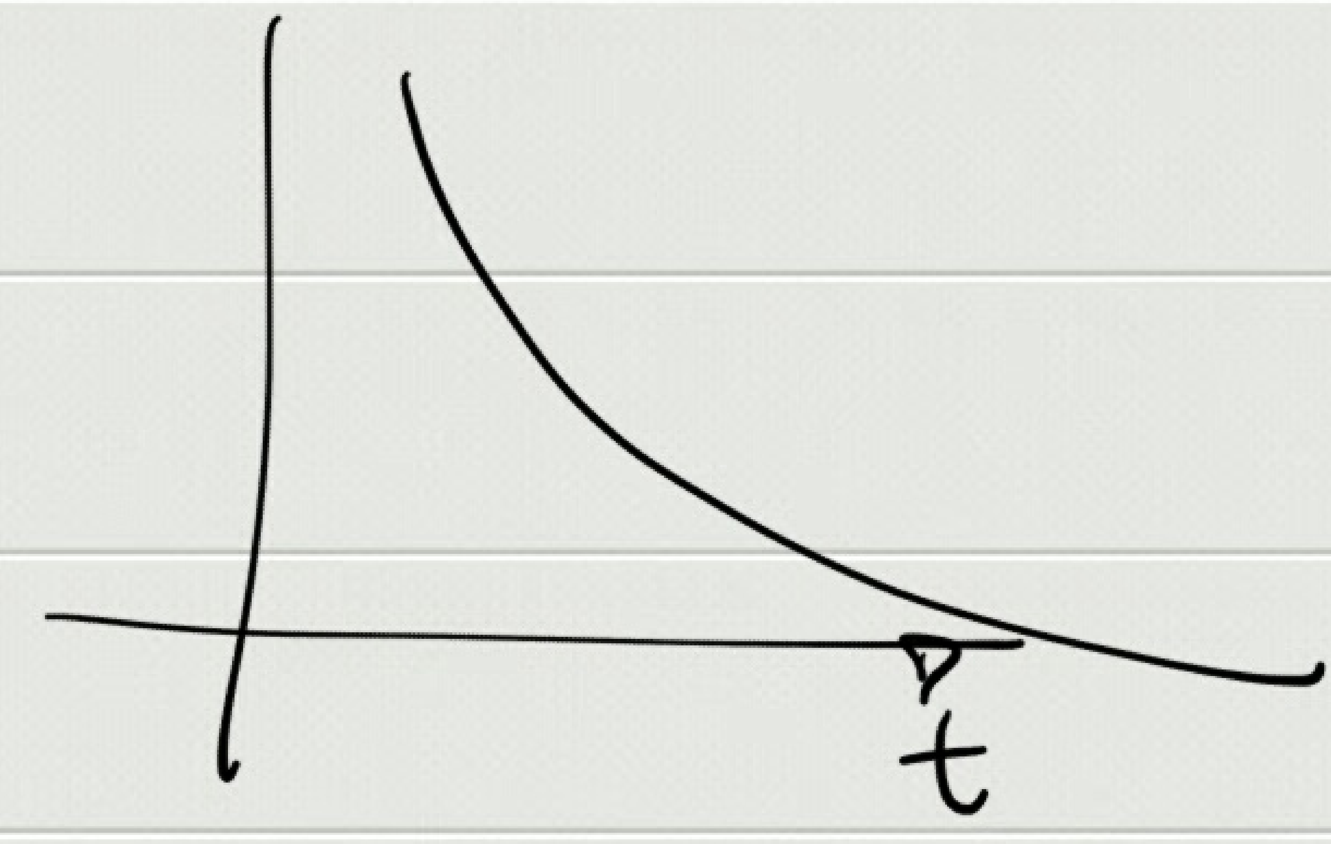
$$\Rightarrow \quad dv = -k\,dx \quad \Rightarrow \quad \int_{v_0}^{v(x)} dv = -k \int_{x_0}^{x} dx$$

$$\Rightarrow \boxed{v(x) = v_0 - k\,(x - x_0)}$$

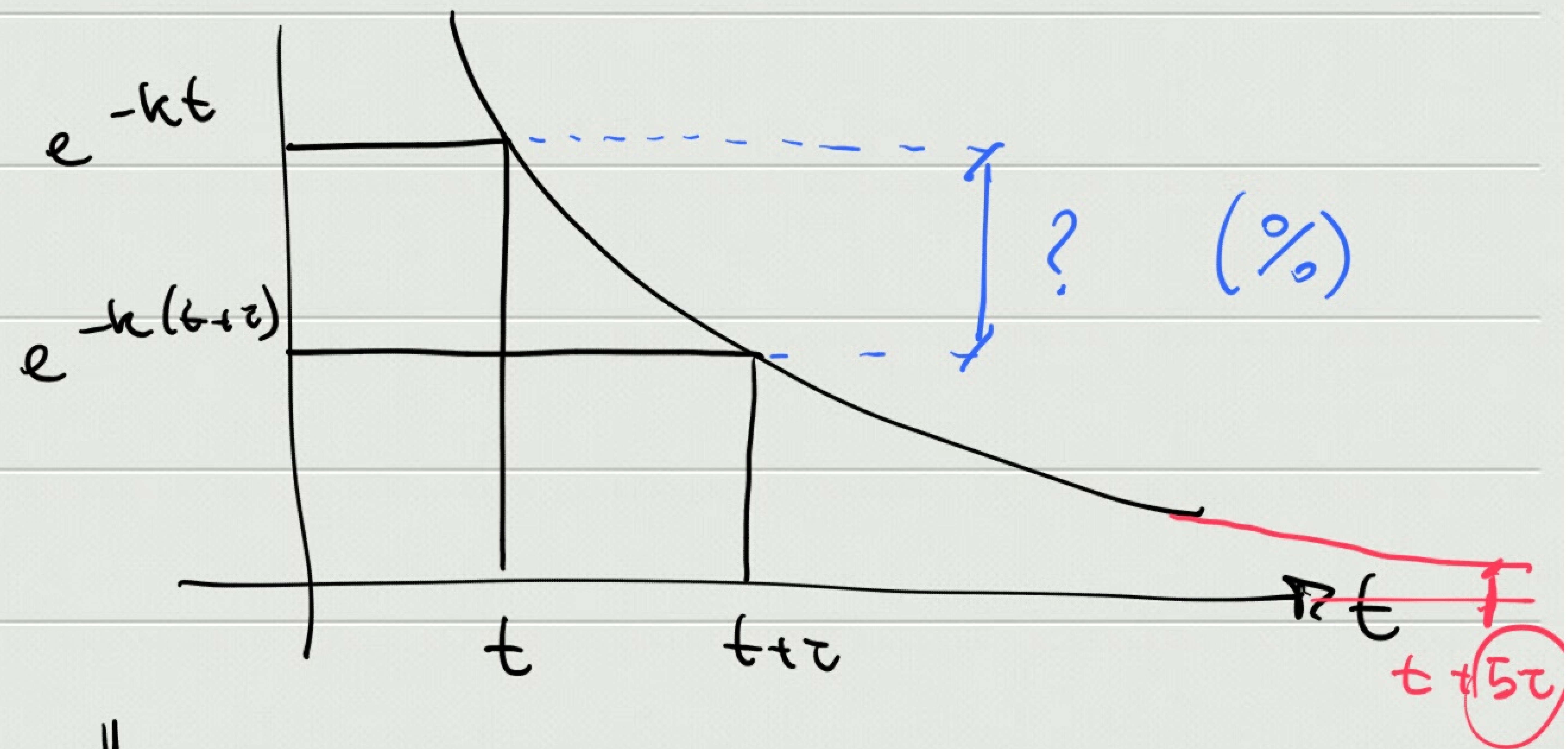


$$v_{lim} = v\left(x = x_0 + \frac{v_0}{k}\right) = v_0 - \cancel{k}\left(\cancel{x_0} + \frac{v_0}{\cancel{k}} - \cancel{x_0}\right) = 0$$

$$f(t) \propto e^{-kt}$$



$$\tau = \frac{1}{k} \qquad [\tau] = s$$



$$\frac{e^{-k(\cancel{t}+\tau)}}{\cancel{e^{-kt}}} = e^{-k\tau} = e^{-1} = \frac{1}{e} \simeq \frac{1}{2.72}$$

$\tau \rightarrow$ costante di tempo

$$\frac{e^{-k(\cancel{t}+5\tau)}}{\cancel{e^{-kt}}} = e^{-5k\tau} \simeq \frac{1}{150}$$

$\Rightarrow$ fenomeno "estinto"