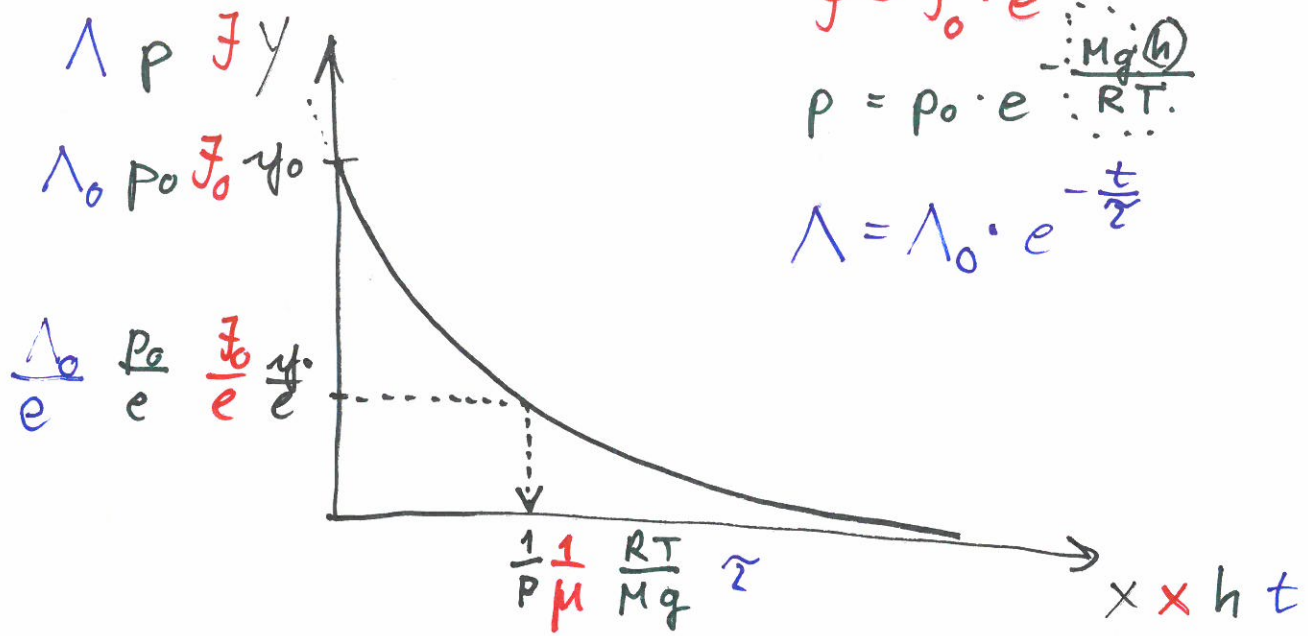


$$y = y_0 \cdot e^{-\rho x}$$

$$J = J_0 \cdot e^{-\mu x}$$

$$\rho = \rho_0 \cdot e^{-\frac{Mg(h)}{RT}}$$

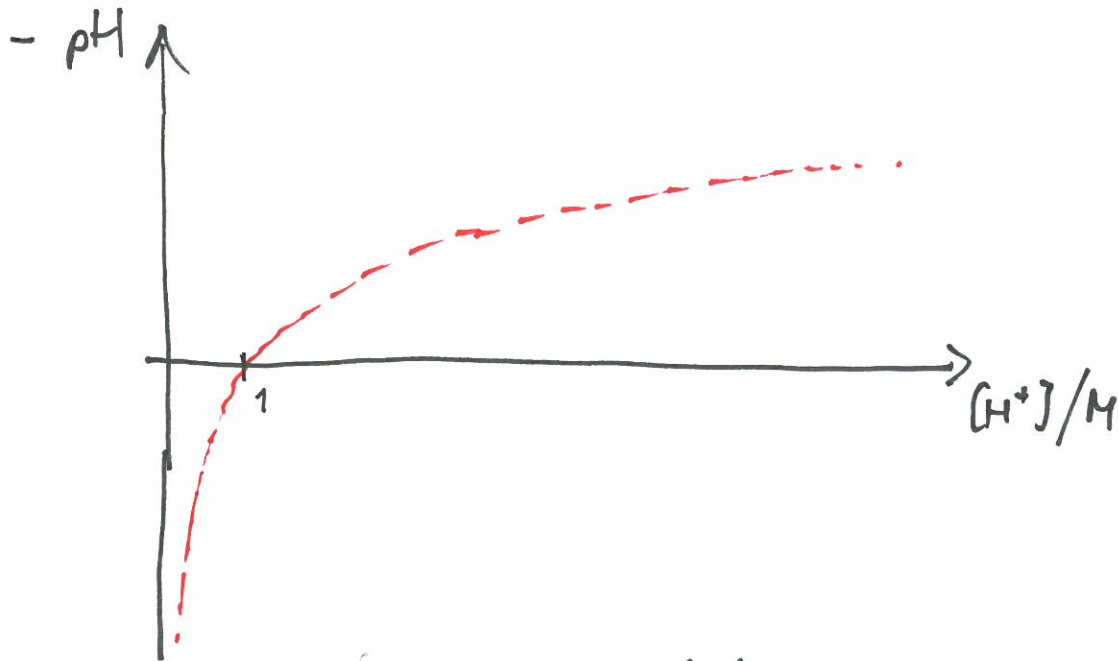
$$\Lambda = \Lambda_0 \cdot e^{-\frac{t}{\tau}}$$



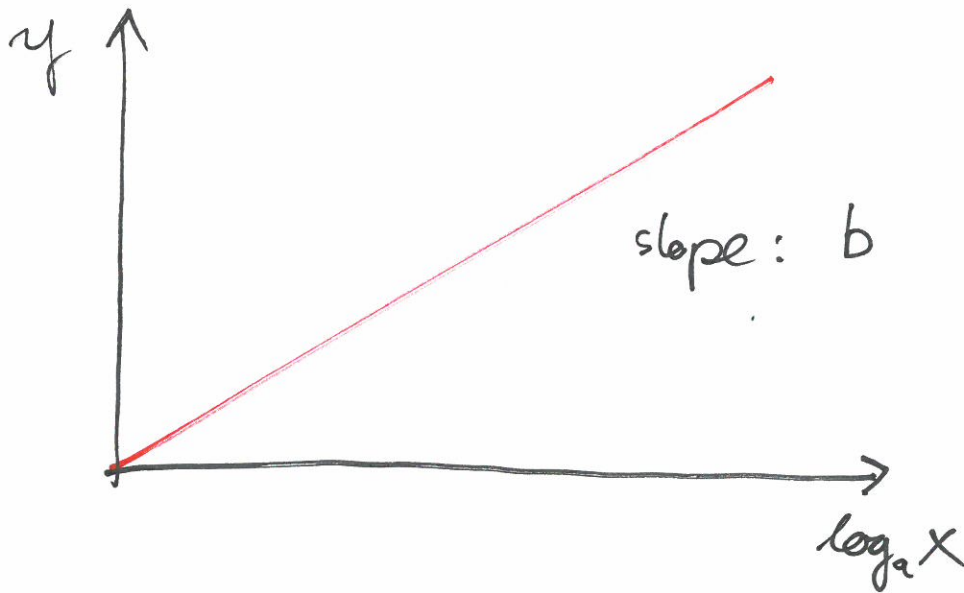
Log Function

$$y = b \cdot \log_a(x)$$

ex. $\text{pH} = -1 \cdot \log_{10}\left(\frac{[\text{H}^+]}{\text{M}}\right)$



linearized plot



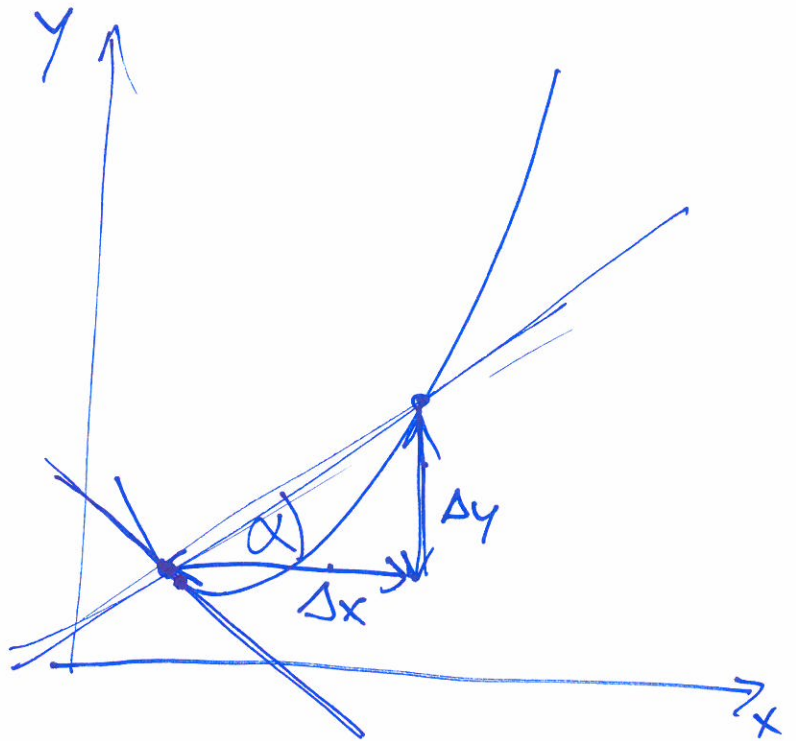
Derivative & Integral

1^2	1	→	3	→	2
2^2	4	→	5	→	2
3^2	9	→	7	→	2
4^2	16	→	9	→	2
\vdots	25	→	11	→	2
\vdots	36	→	13	→	2
\vdots	49	→	15	→	2
\vdots	64	→	17	→	2
\vdots	81	→	19	→	2
10^2	100				

difference quotient

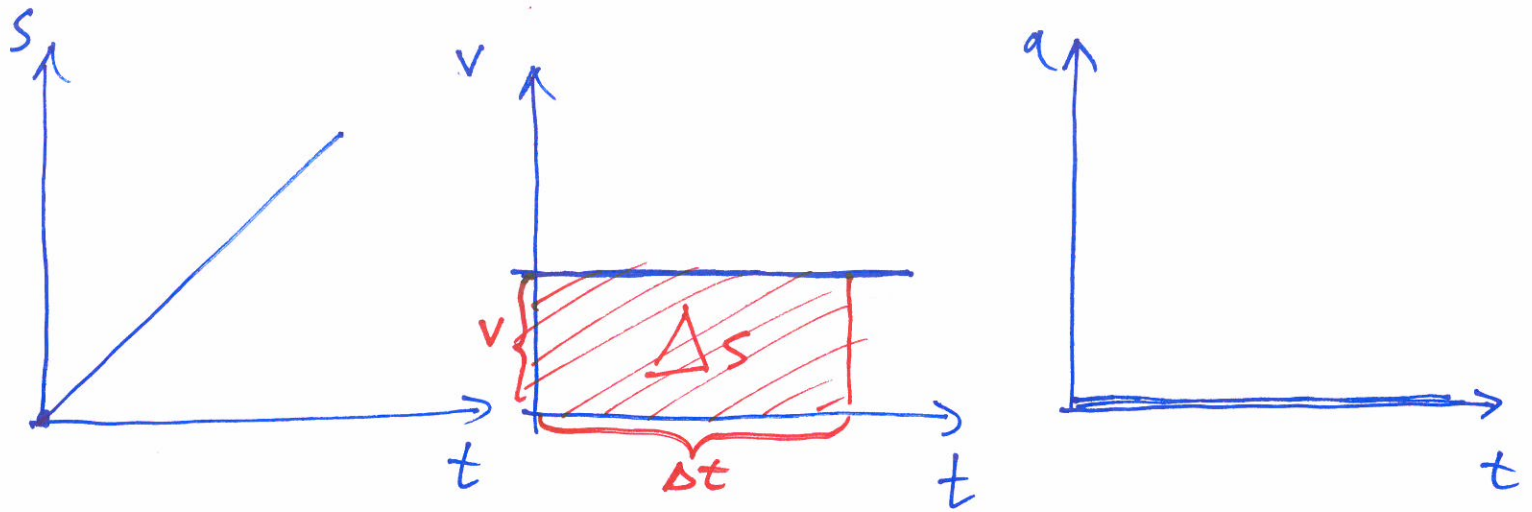
$$\frac{\Delta y}{\Delta x} \longrightarrow \frac{dy}{dx}$$

derivative



$$\sum f(x) \cdot \Delta x \longrightarrow \int f(x) dx$$

~~uniform~~ uniform rectilinear motion



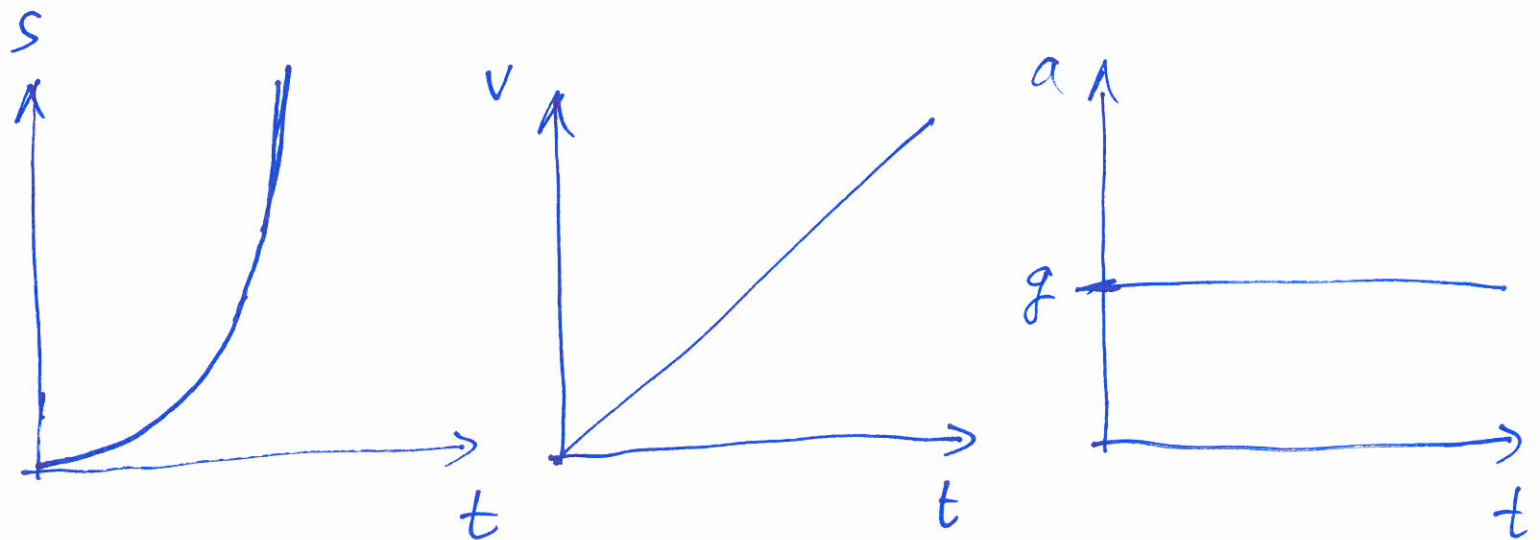
$$\bar{v} = \frac{\Delta s}{\Delta t}$$

$$v = \frac{ds}{dt}$$

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

$$\Delta s = \Delta t \cdot \bar{v}$$

uniform rectilinear acceleration



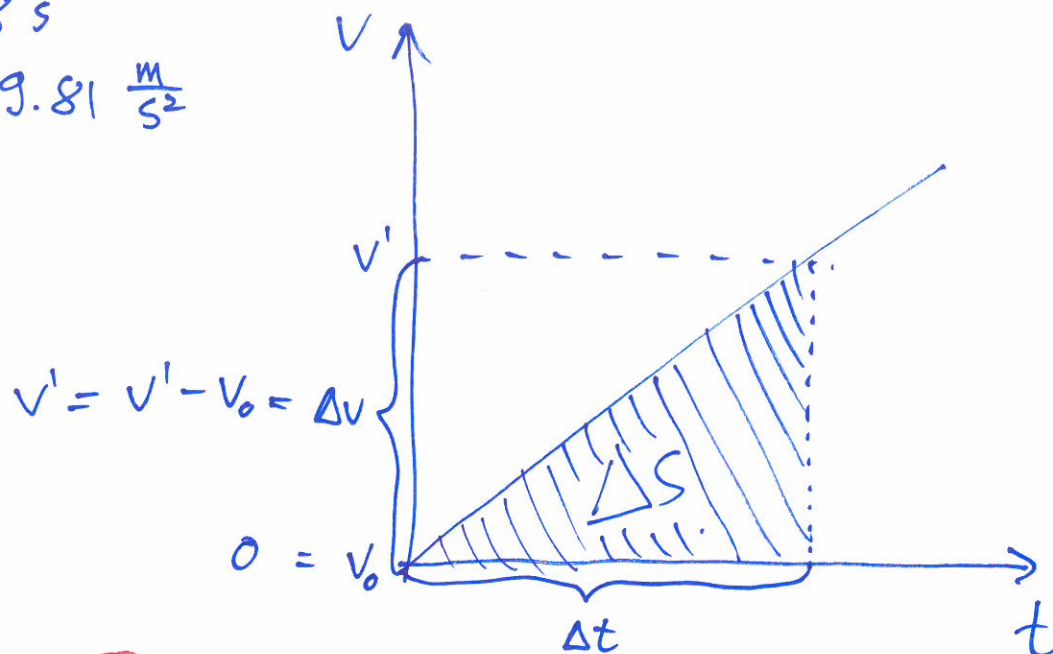
3./6. Problem

$$\Delta t = 0.8 \text{ s}$$

$$a = g = 9.81 \frac{\text{m}}{\text{s}^2}$$

$$v' = ?$$

$$\Delta s = ?$$



$$b) \quad \Delta s = \frac{\Delta v \cdot \Delta t}{2}$$

$$a = \frac{\Delta v}{\Delta t} \rightarrow \Delta v = a \cdot \Delta t$$

$$\Delta s = \frac{a \cdot \Delta t \cdot \Delta t}{2} = \frac{a \cdot (\Delta t)^2}{2}$$

$$\Delta s = \frac{9.81 \frac{\text{m}}{\text{s}^2} \cdot (0.8 \text{ s})^2}{2} = \underline{\underline{3.1392 \text{ m}}}$$

$$\frac{\frac{\text{m}}{\text{s}^2} \cdot \text{s}^2}{1} = \text{m}$$

$$a) \quad \Delta v = ?$$

$$2 \cdot \Delta s = \Delta v \cdot \Delta t$$

$$\frac{2 \cdot \Delta s}{\Delta t} = \Delta v \quad \Delta v = \frac{2 \cdot 3.1392 \text{ m}}{0.8 \text{ s}} = 7.848 \frac{\text{m}}{\text{s}}$$

$$\downarrow$$

$$\underline{\underline{28.253 \frac{\text{km}}{\text{h}}}}$$

3/3 Problem

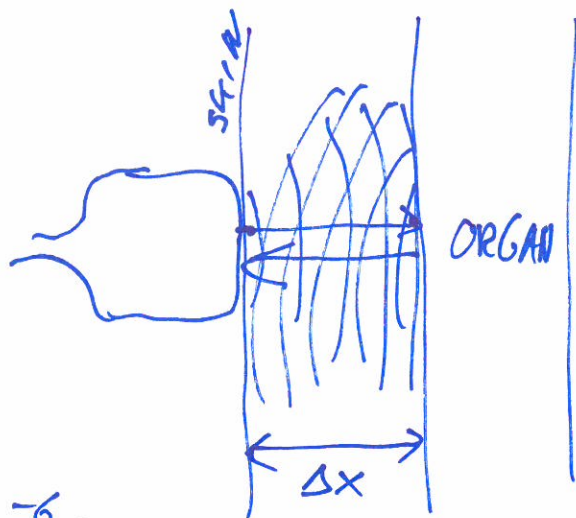
$$\Delta t = 80 \mu s = 80 \times 10^{-6} s$$

$$v = c = 1500 \frac{m}{s}$$

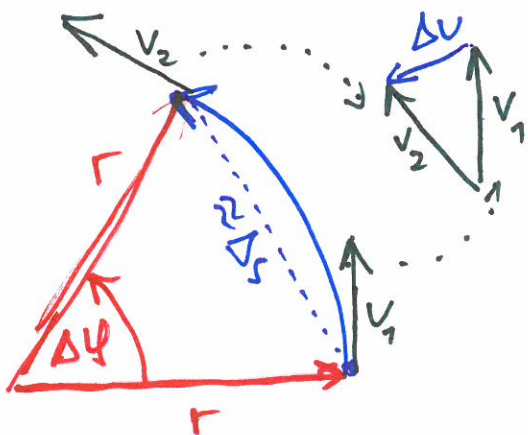
← due to reflection!

$$v = \frac{2 \cdot \Delta x}{\Delta t}$$

$$\Delta x = \frac{v \cdot \Delta t}{2} = \frac{1500 \frac{m}{s} \cdot 80 \times 10^{-6} s}{2} = 0.06 m = 6 cm$$



Circular Motion



centripetal acceleration

$$a_{cp} = \frac{\Delta v}{\Delta t}$$

(1) for small angles:

$$\Delta s = v \cdot \Delta t$$

(2) similar triangles:

$$\frac{\Delta s}{r} = \frac{\Delta v}{v}$$

$$[\Delta \varphi] = \text{rad}$$

$$\omega = \frac{\Delta \varphi}{\Delta t}$$

$$[\omega] = \frac{\text{rad}}{s} \left(\frac{1}{s} \right)$$

$$v_{tan} = \frac{\Delta s}{\Delta t}$$

$$= \frac{r \cdot \Delta \varphi}{\Delta t} = r \cdot \omega$$

$$[v_{tan}] = \frac{m}{s}$$

$$\Delta \varphi = \frac{\Delta s}{r}$$

↓

$$r \cdot \Delta \varphi = \Delta s$$

(1) + (2):

$$\frac{v \cdot \Delta t}{r} = \frac{\Delta v}{v}$$

$$\frac{v^2}{r} = \frac{\Delta v}{\Delta t} = a_{cp}$$