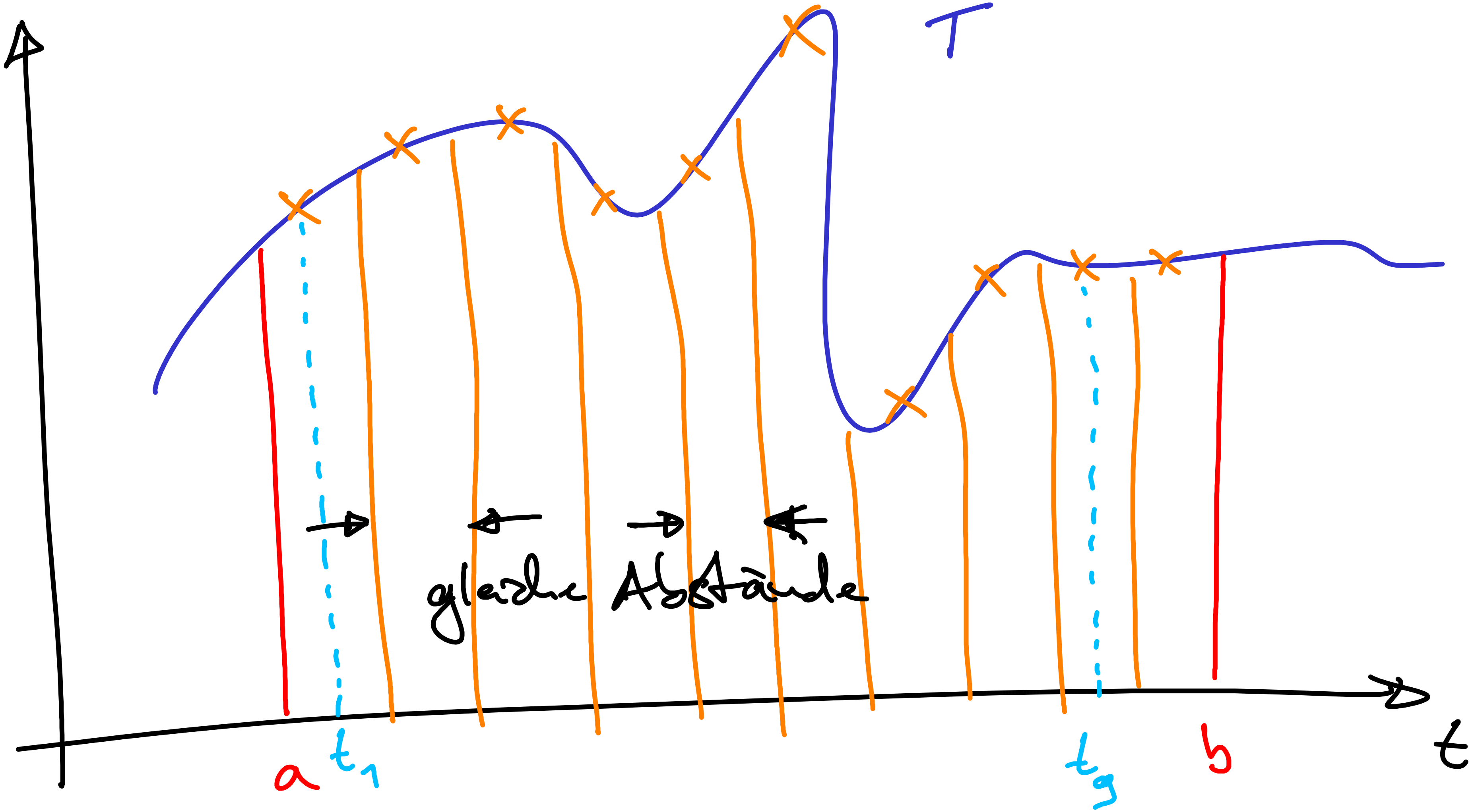
$$f : [0, \pi] \longrightarrow \mathbb{R}^2$$

$$x \longmapsto f(x) = \begin{pmatrix} \sin x \\ \cos x \end{pmatrix}$$

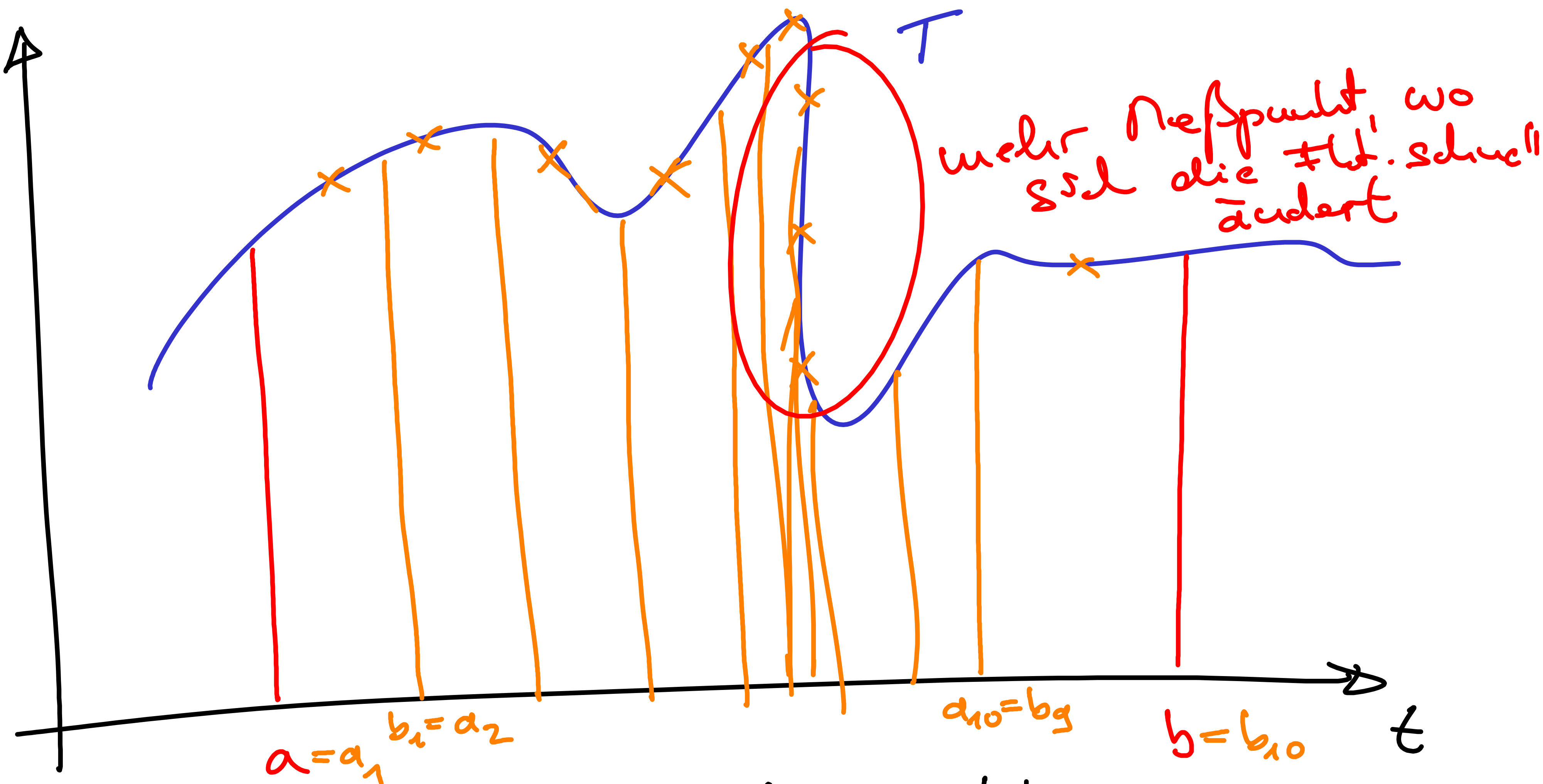
$$F : [0, \pi] \longrightarrow \mathbb{R}^2$$

$$x \longmapsto F(x) = \begin{pmatrix} -\cos x \\ \sin x \end{pmatrix}$$

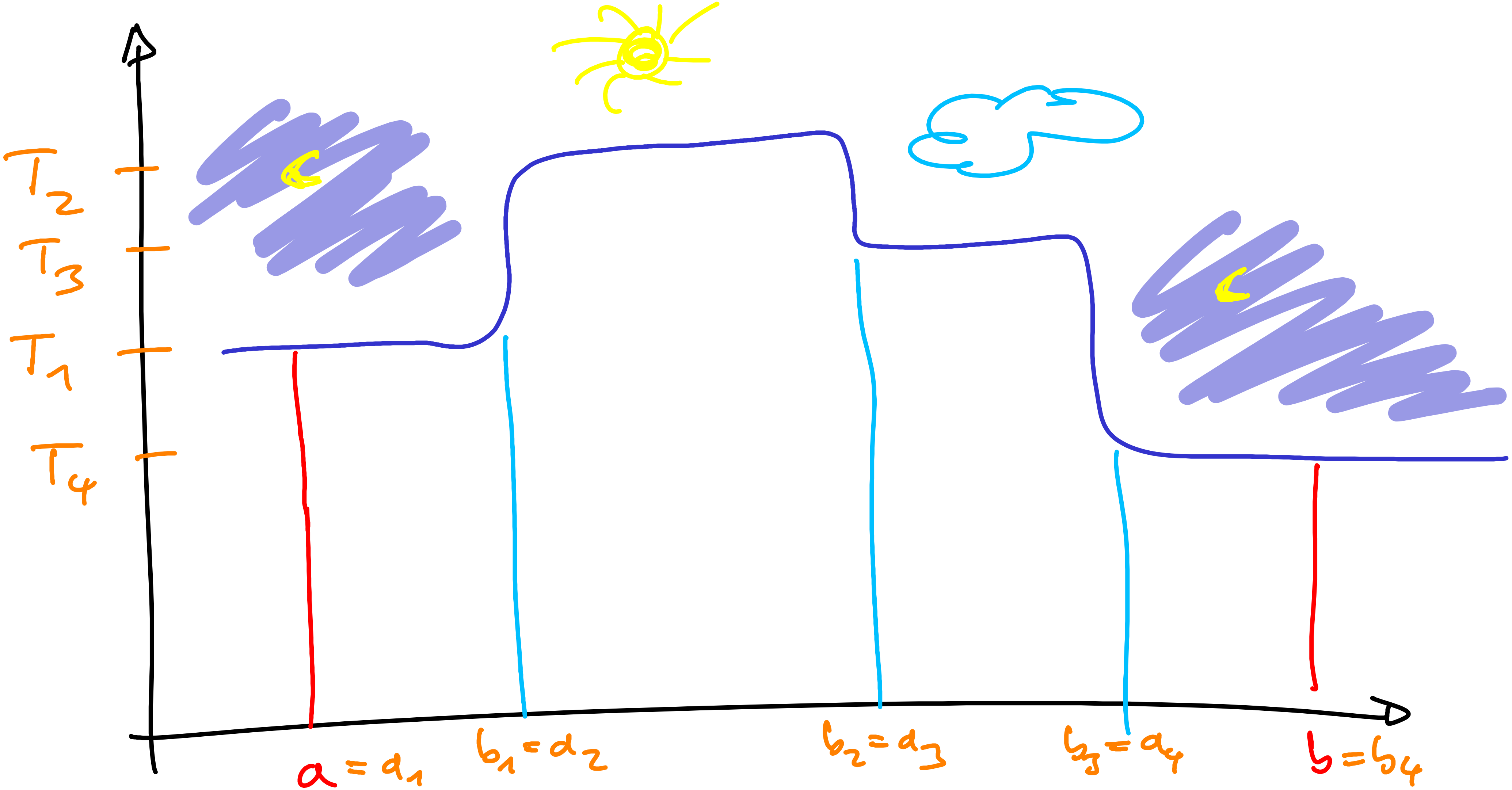
$F' = f$, also ist F Stammfunktion von f



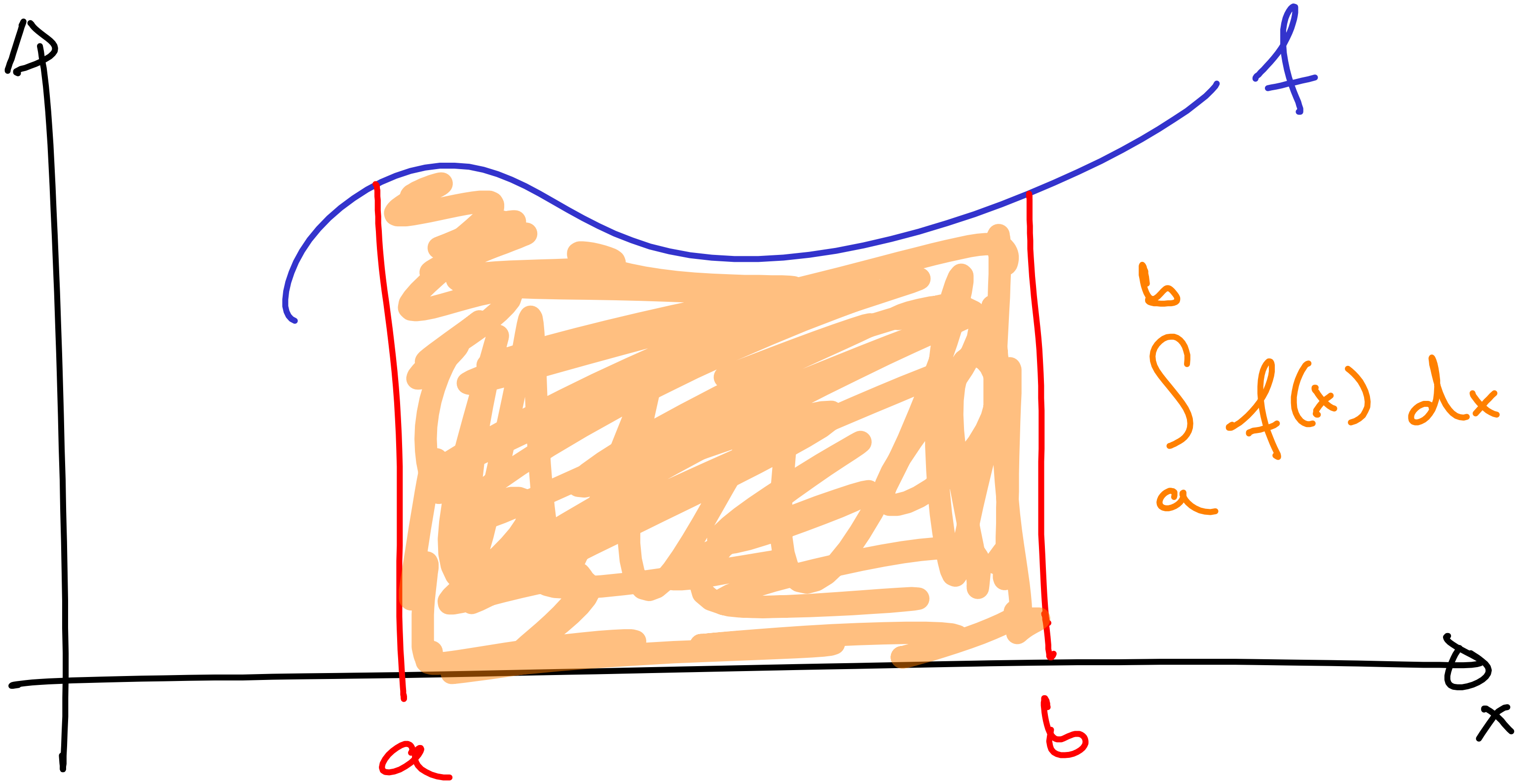
$$\bar{T} = \frac{1}{10} \sum_{i=1}^{10} T(t_i)$$



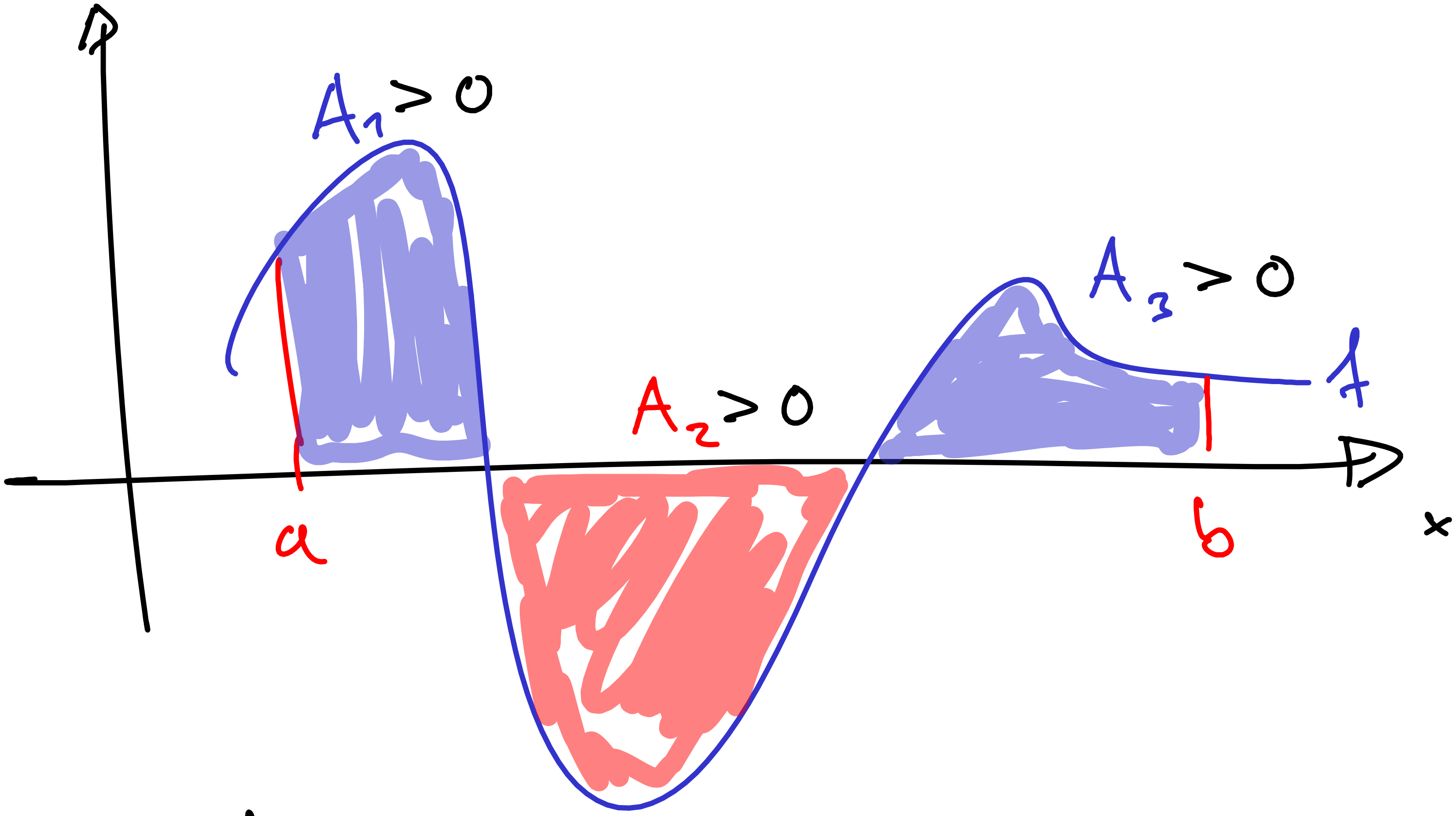
→ gewichtetes Mittel



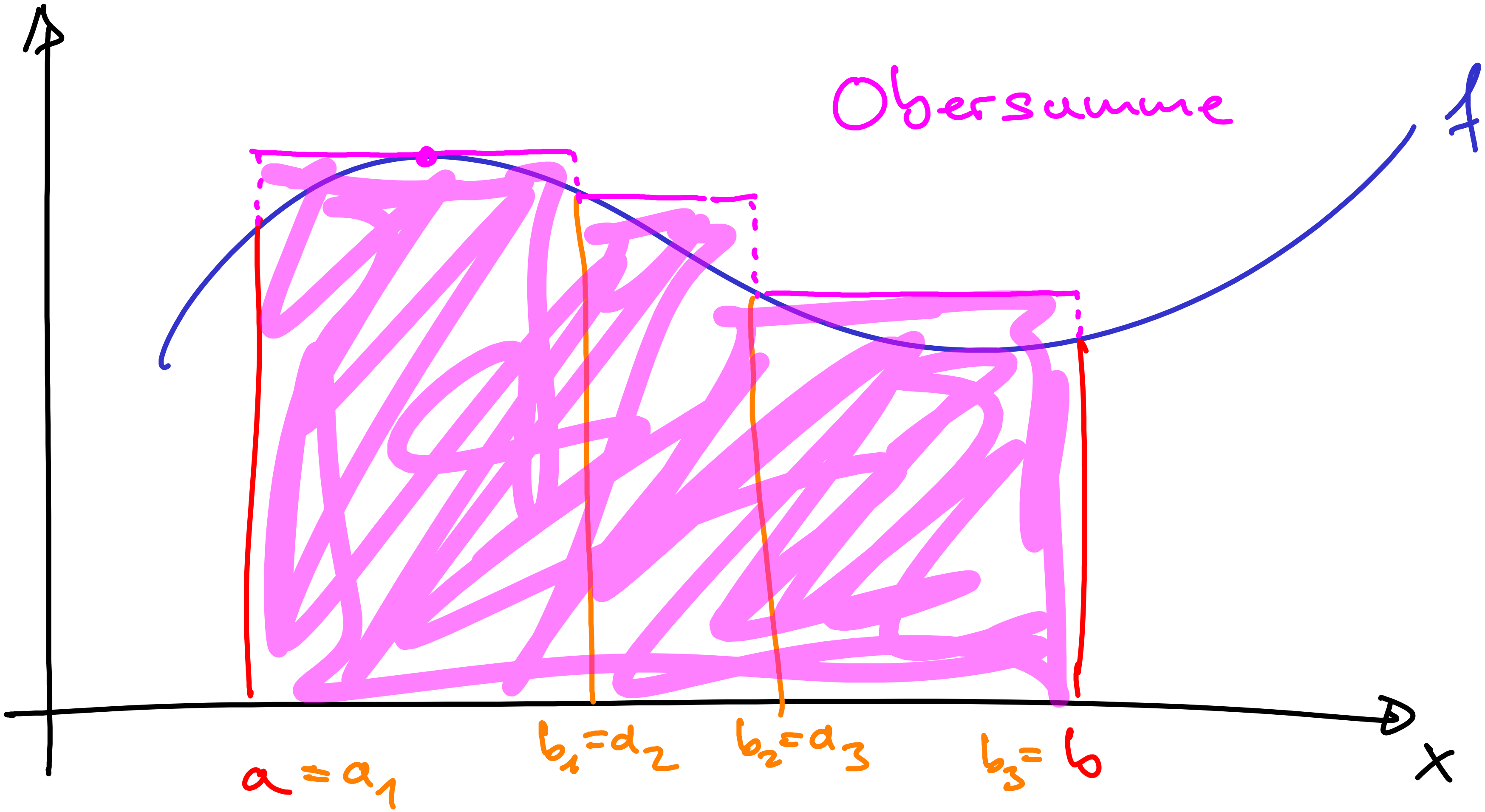
$$\overline{T} = T_1 \frac{b_1 - a_1}{b - a} + T_2 \frac{b_2 - a_2}{b - a} + T_3 \frac{b_3 - a_3}{b - a} + T_4 \frac{b_4 - a_4}{b - a}$$



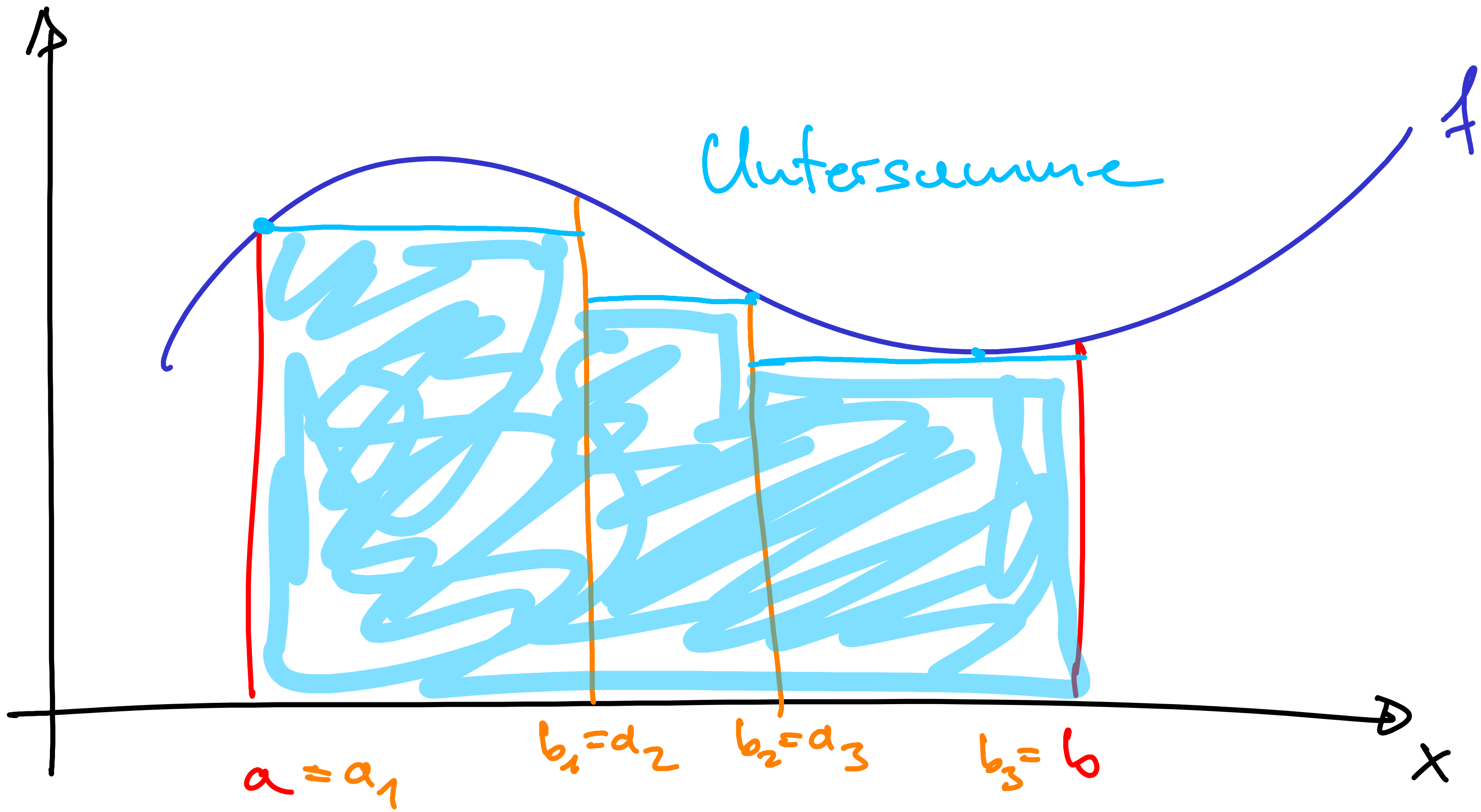
"Definition" für "$\int$"



$$\int_a^b f(x)\,dx = A_1 - A_2 + A_3$$

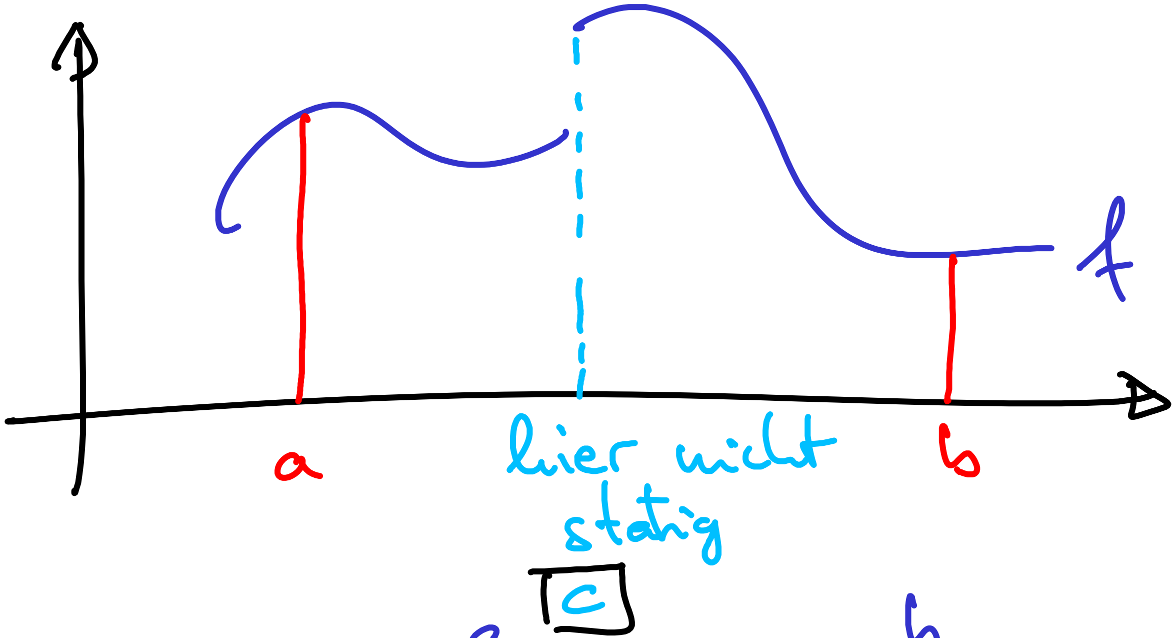


Obersumme
f
x
a = a1
b1 = a2
b2 = a3
b3 = b



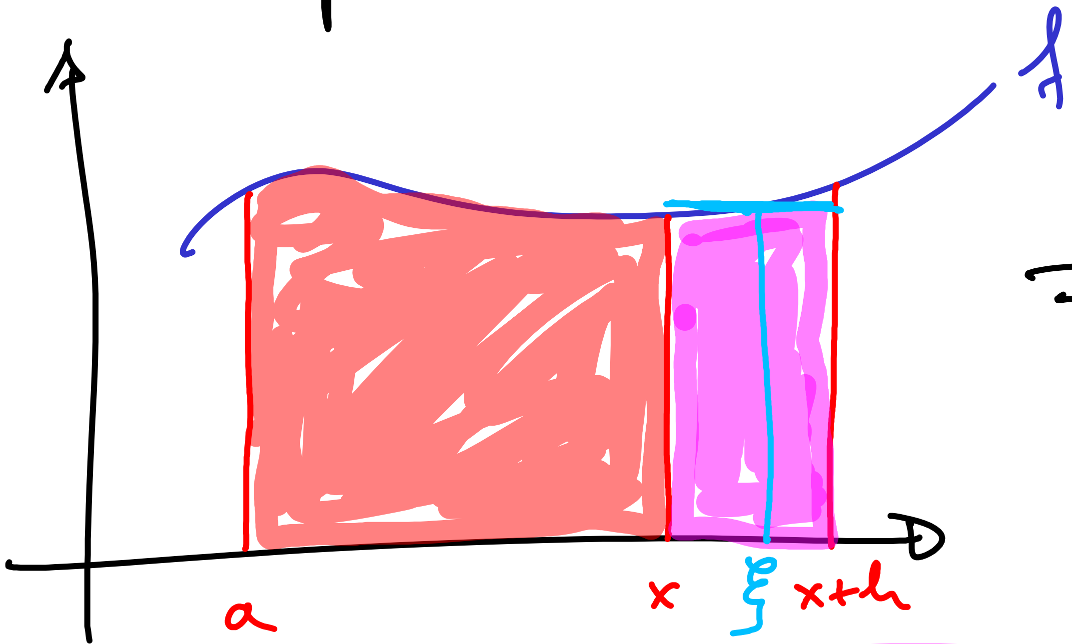
Untersumme
f
x
a = a1
b1=a2
b2=a3
b3= b

Bemerkung: Stetigkeit kann zu stückweiser Stetigkeit abgeschwächt werden, d.h.



$$\int_a^b f(x)\,dx := \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$$

zum Hauptsatz



$$F(x) = \int_a^x f(y)\,dy$$

es gibt ein $\xi \in [x, x+h]$, so dass ...

$$F'(x) = \lim_{h\to 0} \frac{F(x+h) - F(x)}{h} = \lim_{h\to 0} \frac{f(\xi)\cdot \cancel{h}}{\cancel{h}}$$

$$\xi \xrightarrow[h\to 0]{} x$$

$$= f(x) \quad (\text{da } f \text{ stetig})$$

ξ das ist ein Xi

$$\int_0^1 (7 + x^3 - 2x)\,dx$$

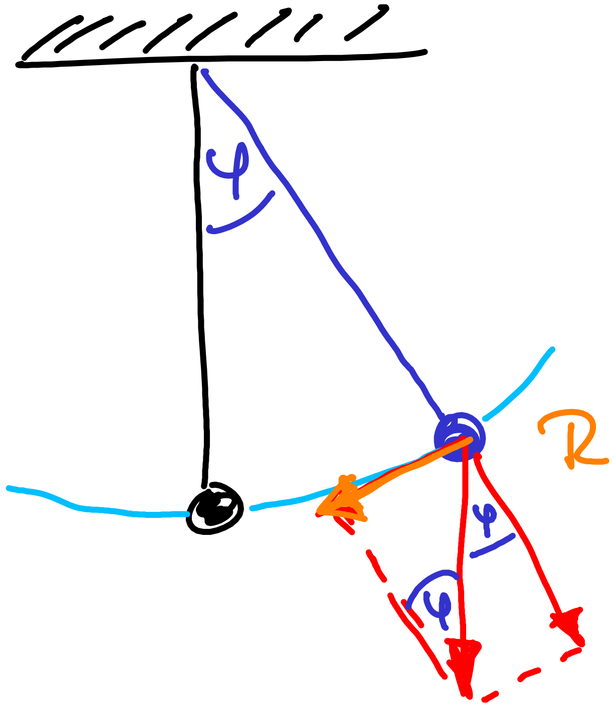
$$= \int_0^1 7\,dx + \int_0^1 x^3\,dx - \int_0^1 2x\,dx$$

$$= \left[7x\right]_0^1 + \left[\tfrac{1}{4}x^4\right]_0^1 - 2\int_0^1 x\,dx$$

Schreibweise: $\left[F(x)\right]_a^b = F(b) - F(a)$

$$= (7 - 0) + \left(\tfrac{1}{4} - 0\right) - 2\left[\tfrac{1}{2}x^2\right]_0^1$$

$$= 7 + \tfrac{1}{4} - 2\left(\tfrac{1}{2} - 0\right) = 6{,}25$$



Rückstellkraft $= \underbrace{m\cdot g}_{\text{Gewichtskraft}} \cdot \sin\varphi$

Energie (Arbeit) die aufgewendet wird um Pendel aus der Ruhelage um $45^\circ = \frac{\pi}{4}$ auszulenken.

$$A = \int_0^{\pi/4} \underbrace{m\cdot g\cdot \sin\varphi}_{\text{Kraft}} \cdot \underbrace{l\,d\varphi}_{\text{Weg}}$$

$$= m\cdot g\cdot l\left[-\cos\varphi\right]_0^{\pi/4} = mgl\left(1-\cos\left(\frac{\pi}{4}\right)\right)$$

$$= mgl\left(-\frac{1}{2}\sqrt{2} - (-1)\right)$$

$$= m \cdot g \cdot l\left(1 - \frac{1}{2}\sqrt{2}\right)$$

$$\approx m \cdot g \cdot l \cdot 0{,}3$$