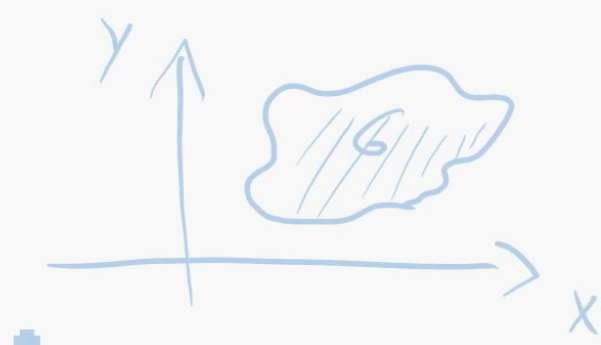


Aufgabe 1

(a) Skizziere die Menge



$$G := \{(x, y) \in \mathbb{R}^2 \mid 0 \leq x \leq 1 \leq y, y + x^2 \leq 3\}.$$

(b) Berechne das zweidimensionale Integral

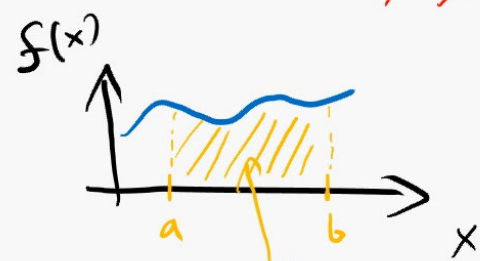
$$\int_G x^2 d(x, y)$$

Mehrdimensionale Integration

"Volumen" messen

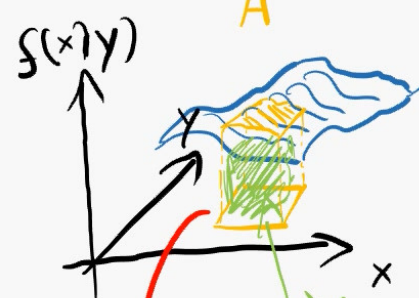
1, 2, 3 oder 4 dimensional

1-dim: Integration:



$$\int_a^b f(x) dx = A \leftarrow \text{Fläche}$$

2-dim. Integration:



$$\int_{[a_1, b_1] \times [a_2, b_2]} f(x, y) d(x, y) = V \leftarrow \text{Volumen}$$

Riemann-Summen definiert

Wie rechne ich das Integral aus?

Wenn f stetig ist, dann gilt:

$$\int_{[a_1, b_1] \times [a_2, b_2]} f(x, y) d(x, y) = \int_{a_2}^{b_2} \left(\int_{a_1}^{b_1} f(x, y) dx \right) dy$$

2 ein-dim. Integrale

Satz v. Fubini: (zum Ausrechnen)

f stetig, dann gilt:

$$\int_{[a_1, b_1] \times [a_2, b_2]} f(x, y) d(x, y) = \int_{a_1}^{b_1} \left(\int_{a_2}^{b_2} f(x, y) dy \right) dx$$

$$= \int_{a_2}^{b_2} \left(\int_{a_1}^{b_1} f(x, y) dx \right) dy$$