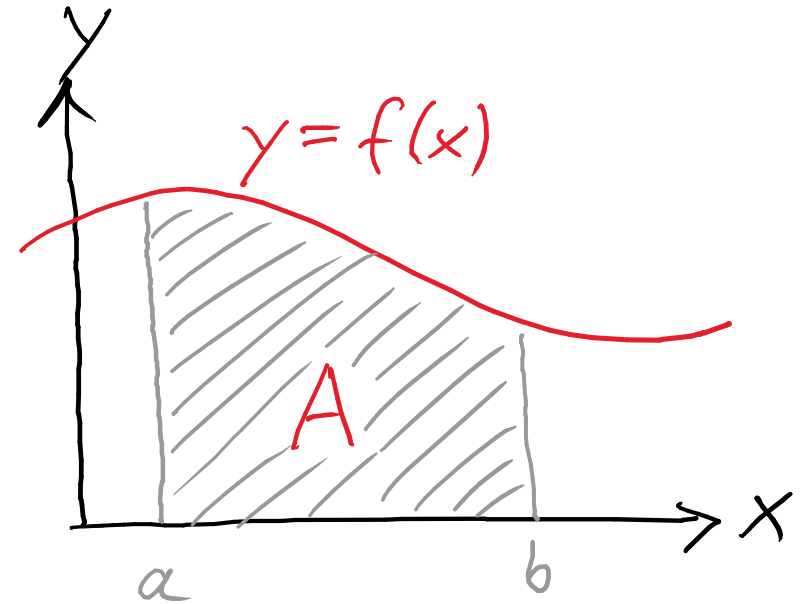


Integration

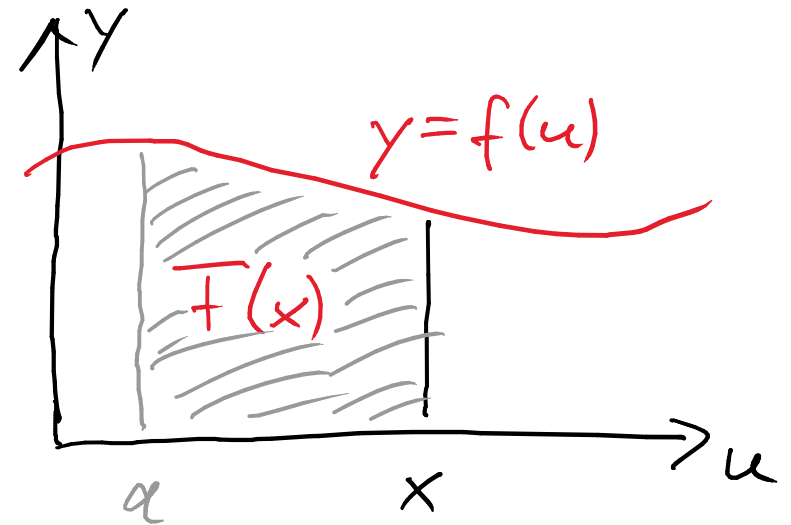
Definite Integral

$$A = \int_a^b f(x) dx \rightarrow \text{Area under curve between } [a, b]$$



Indefinite Integral

$$F(x) = \int_a^x f(u) du \rightarrow \text{Function of upper limit}$$



Fundamental Theorem of Calculus

$$\frac{dF(x)}{dx} = f(x) \Leftrightarrow \int f(x) dx = F(x) + C$$

Integration Techniques

- Find anti-derivative of function $f(x) = x \Rightarrow F(x) = \frac{1}{2}x^2 + c$
- Definite integral $\int_1^2 f(x) dx = [F(x)]_1^2 = F(2) - F(1) = \frac{3}{2}$
- Basic functions
$$\int x^n dx = \frac{x^{n+1}}{n+1} + c, \quad \int \frac{1}{x} dx = \ln|x| + c, \quad \int e^x dx = e^x + c$$
$$\int \sin x dx = -\cos x + c, \quad \int \cos x dx = \sin x + c, \quad \int \tan x dx = -\ln|\cos x| + c$$
- Symmetry considerations, e.g. $\int_{-a}^a f_{\text{odd}}(x) dx = 0$
- Integration by substitution