# Analysis 3 - Formeln

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$$\exp : \mathbb{C} \to \mathbb{C} : z \mapsto \sum_{n=0}^{\infty} \frac{z^n}{n!}$$

$$\sin : \mathbb{C} \to \mathbb{C} : z \mapsto \frac{\exp(\mathrm{i}z) - \exp(-\mathrm{i}z)}{2\mathrm{i}} = \sum_{k=0}^{\infty} (-1)^k \frac{z^{2k+1}}{(2k+1)!}$$

$$\cos : \mathbb{C} \to \mathbb{C} : z \mapsto \frac{\exp(\mathrm{i}z) + \exp(-\mathrm{i}z)}{2} = \sum_{k=0}^{\infty} (-1)^k \frac{z^{2k}}{(2k)!}$$

$$\forall x \in \mathbb{R}^+ : \sin(x) < x$$

$$\forall x, y \in \mathbb{R} : \sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y)$$

$$\forall x, y \in \mathbb{R} : \cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

$$\forall z \in \mathbb{C} : |z| < 1 \Rightarrow \sum_{k=0}^{n} z^k = \frac{1 - z^{n+1}}{1 - z}$$

$$\forall x \in \mathbb{R}^+ : \arctan(x) < x$$

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

$$g : \mathbb{R} \to \mathbb{R} : t \mapsto \exp(-|t|) \Rightarrow \hat{g} : \mathbb{R} \to \mathbb{R} : x \mapsto \frac{1}{1+x^2}\sqrt{\frac{2}{\pi}}$$

$$\forall x \in [-1, 1] : \sin(\arccos(x)) = \cos(\arcsin(x)) = \sqrt{1 - x^2}$$

$$\int_{-\infty}^{\infty} \exp\left(\frac{-x^2}{2}\right) \cos(tx) \mathrm{d}x = \sqrt{2\pi} \exp\left(\frac{-t^2}{2}\right)$$

## Wichtige Stammfunktionen

$$\int kx^n dx = \begin{cases} \frac{k}{n+1}x^{n+1}, & \text{wenn } n \neq -1, \\ k\ln(|x|), & \text{wenn } n = -1. \end{cases}$$

$$\int a^x dx = \frac{a^x}{\ln(a)}$$

$$\int x^x(1+\ln(x))dx = x^x$$

$$\int \log_a(x)dx = \frac{1}{\ln(a)}(x\ln(x) - x)$$

$$\int \sqrt{a^2 - x^2}dx = \frac{a^2}{2}\arcsin\left(\frac{x}{a}\right) + \frac{x}{2}\sqrt{a^2 - x^2}$$

$$\int \sqrt{a^2 + x^2}dx = \frac{a^2}{2}\operatorname{arsinh}\left(\frac{x}{a}\right) + \frac{x}{2}\sqrt{a^2 + x^2}$$

$$\int \sin(x)dx = -\cos(x)$$

$$\int \cos(x)dx = \sin(x)$$

$$\int \sin^n(x)dx = -\frac{\sin^{n-1}(x)\cos(x)}{n} + \frac{n-1}{n}\int \sin^{n-2}(x)dx$$

$$\int \tan(x)dx = -\ln(|\cos(x)|)$$

$$\int \cos^n(x)dx = \frac{\cos^{n-1}(x)\sin(x)}{n} + \frac{n-1}{n}\int \cos^{n-2}(x)dx$$

$$\int \cot(x)dx = \ln(|\sin(x)|)$$

$$\int \frac{1}{\cos^2(x)}dx = \tan(x)$$

$$\int \frac{-1}{\sin^2(x)}dx = \cot(x)$$

$$\int \frac{1}{\sqrt{1-x^2}}dx = \arcsin(x)$$

$$\int \frac{-1}{\sqrt{1-x^2}}dx = \arccos(x)$$

$$\int \frac{1}{x^2+1}dx = \arctan(x)$$

$$\int \frac{x^2}{x^2+1}dx = x - \arctan(x)$$