

Mathematische Grundlagen

Vorlesung 10 – Lösungen

1. (a) $\sqrt{1+u} = 1 + \frac{1}{2}u - \frac{1}{8}u^2 + \dots$
- (b) $\frac{1-t^2}{1+2t} = 1 - 2t + 3t^2 + \dots$
- (c) $\cos \varphi = \frac{1}{\sqrt{2}} \left[1 - \Delta\varphi - \frac{1}{2}(\Delta\varphi)^2 + \dots \right] \quad \Delta\varphi = \varphi - \frac{\pi}{4}$

2. (a) $\frac{\sin x}{x} = 1 - \frac{x^2}{3!} + \frac{x^4}{5!} + \dots$
- (b) $\frac{\sinh x}{x} = 1 + \frac{x^2}{3!} + \frac{x^4}{5!} + \dots$

3. (a) $\left(\frac{x^k}{k!}\right)' = \frac{x^{k-1}}{(k-1)!}$
- (b) Unbestimmte Integration (Integrationskonstanten?):

$$\log(1+x) = \int dx \sum_{k=0}^{\infty} (-1)^k x^k = \sum_{k=0}^{\infty} \frac{(-1)^k}{k+1} x^{k+1}$$
 Besser gliedweise als bestimmtes Integral:

$$\log(1+x) = \int_0^x du \frac{1}{1+u} = \dots$$