Kugelkoordinaten

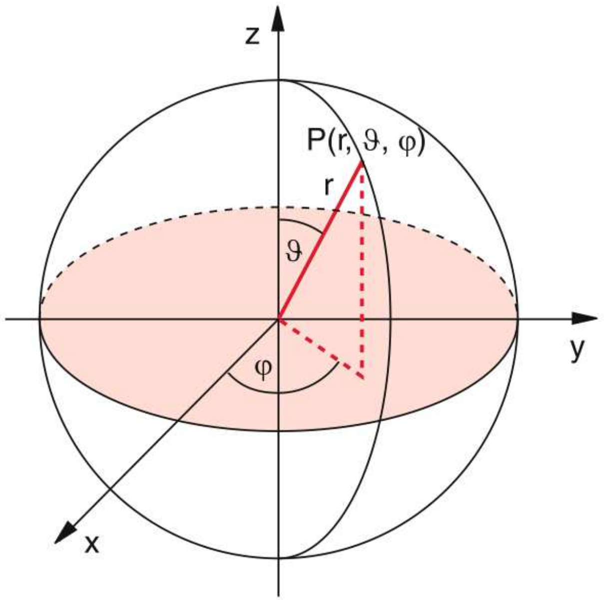


Abbildung 13.2 Kugelkoordinaten r, ϑ, φ

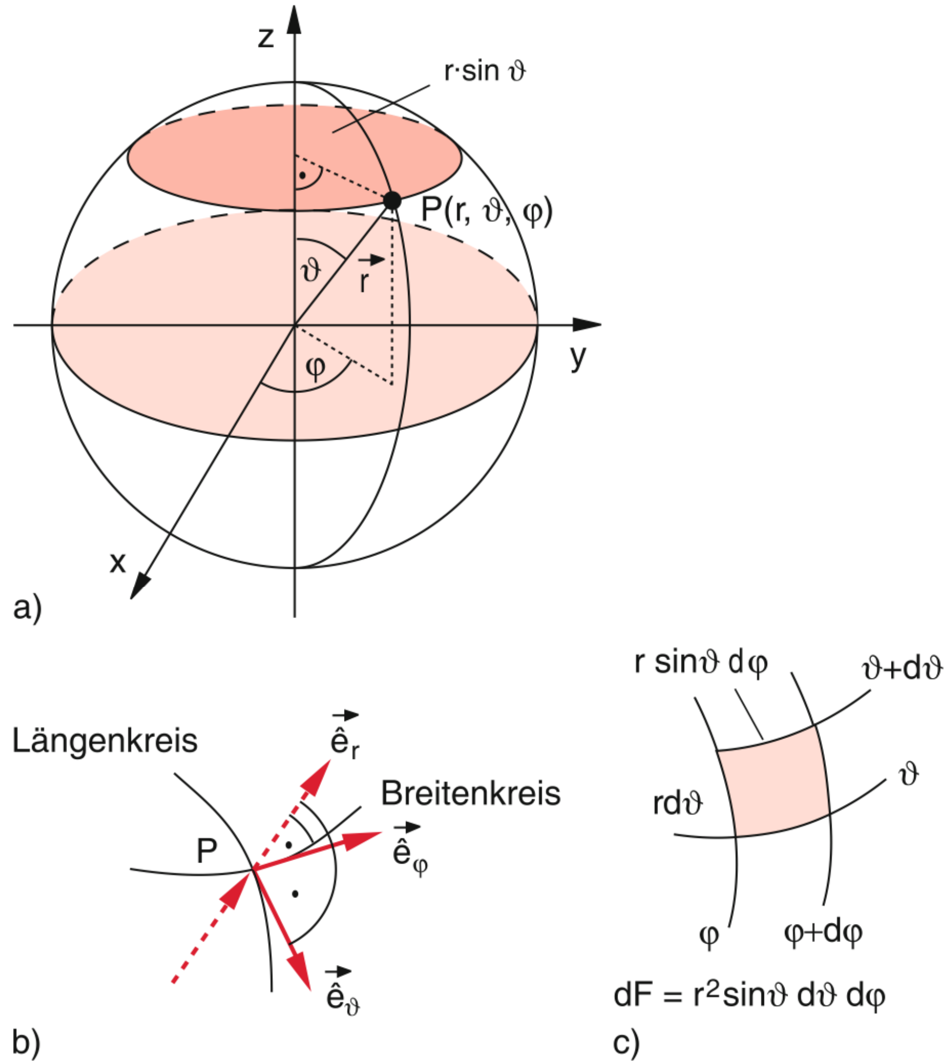
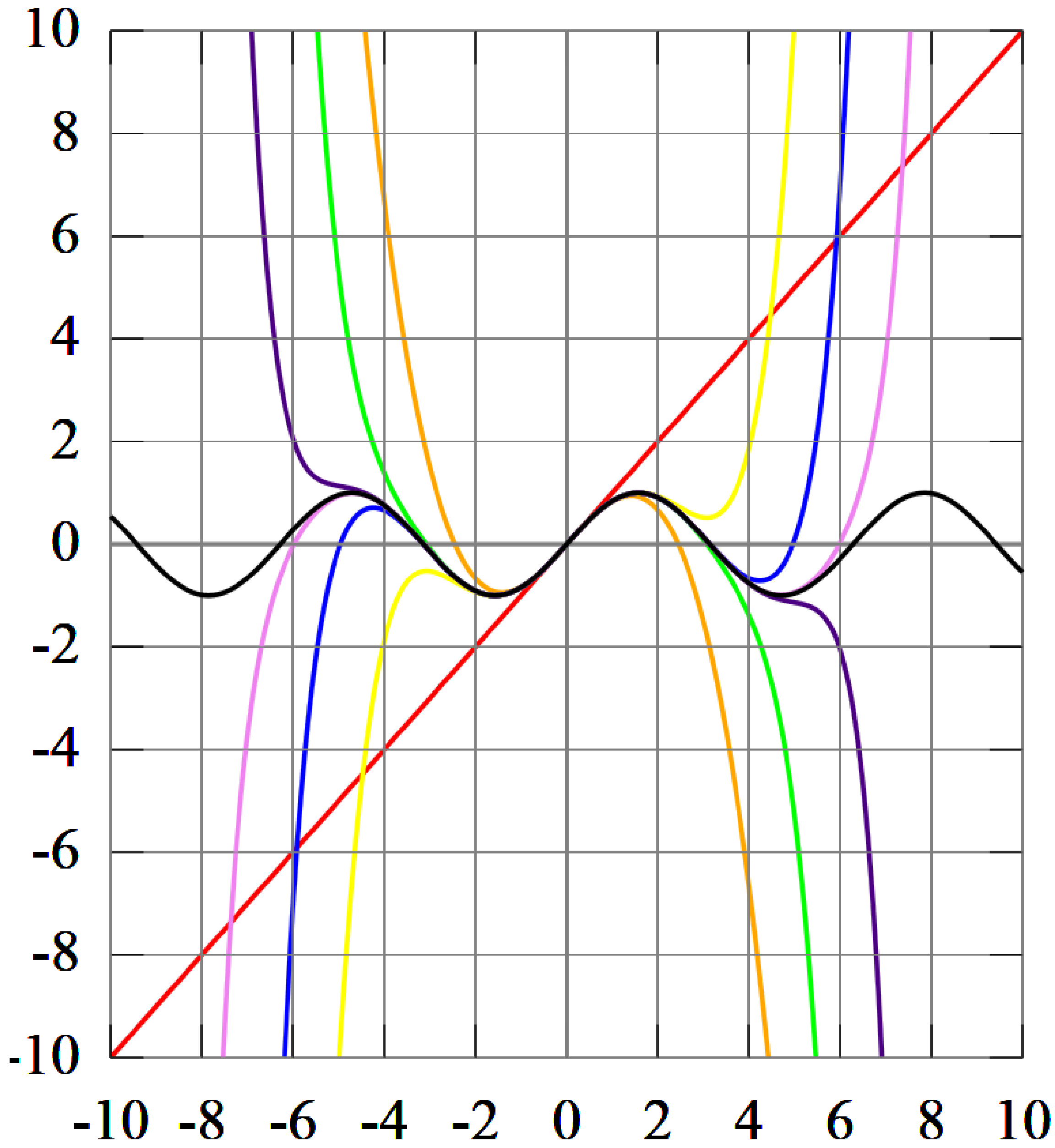


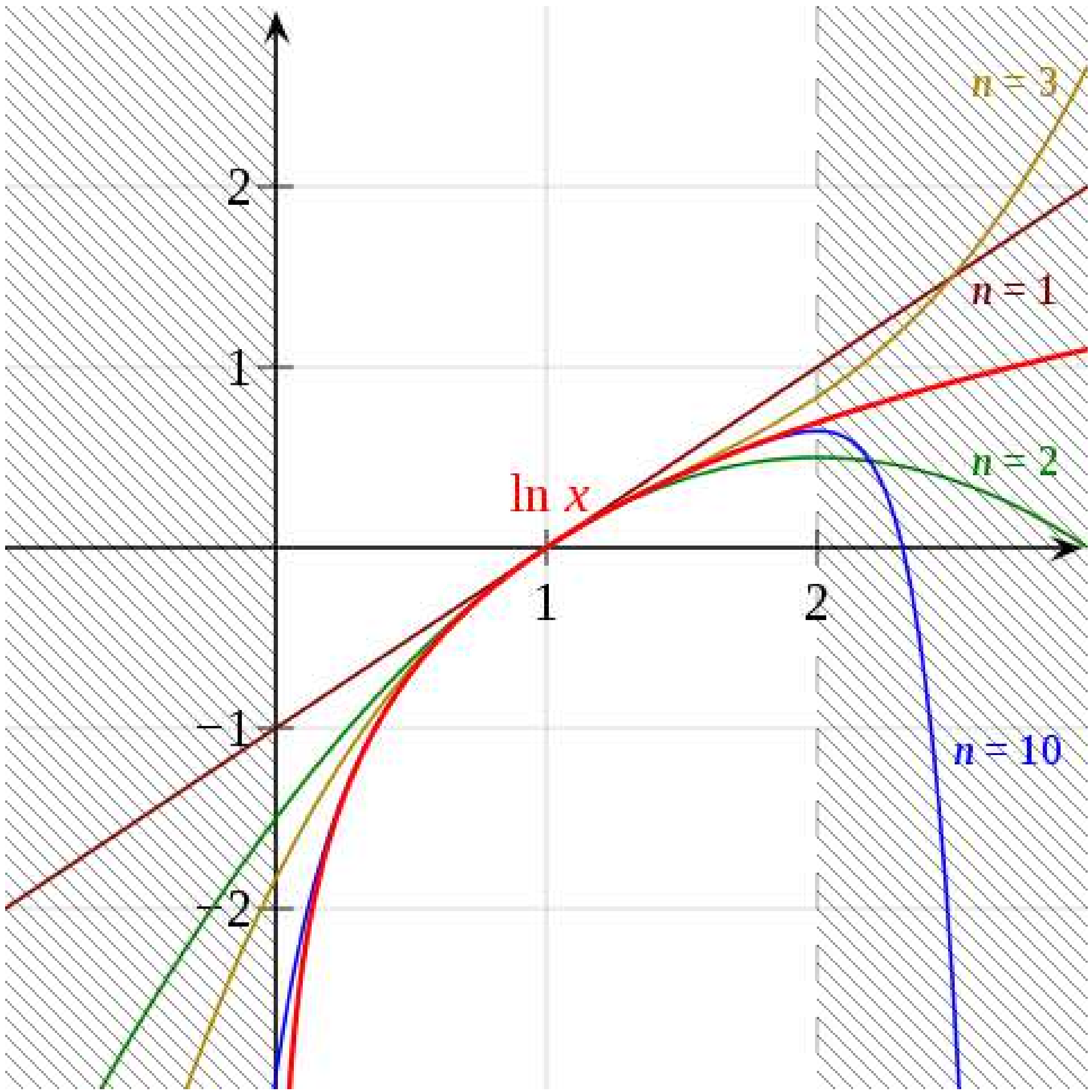
Abbildung 13.13 **a** Kugelkoordinaten, **b** orthogonales Dreibein der Einheitsvektoren $\hat{\boldsymbol{e}}_r$, $\hat{\boldsymbol{e}}_\vartheta$, $\hat{\boldsymbol{e}}_\varphi$ im Punkte P. **c** Flächenelement auf der Kugeloberfläche

Taylor-Reihe

https://en.wikipedia.org/wiki/Taylor_series

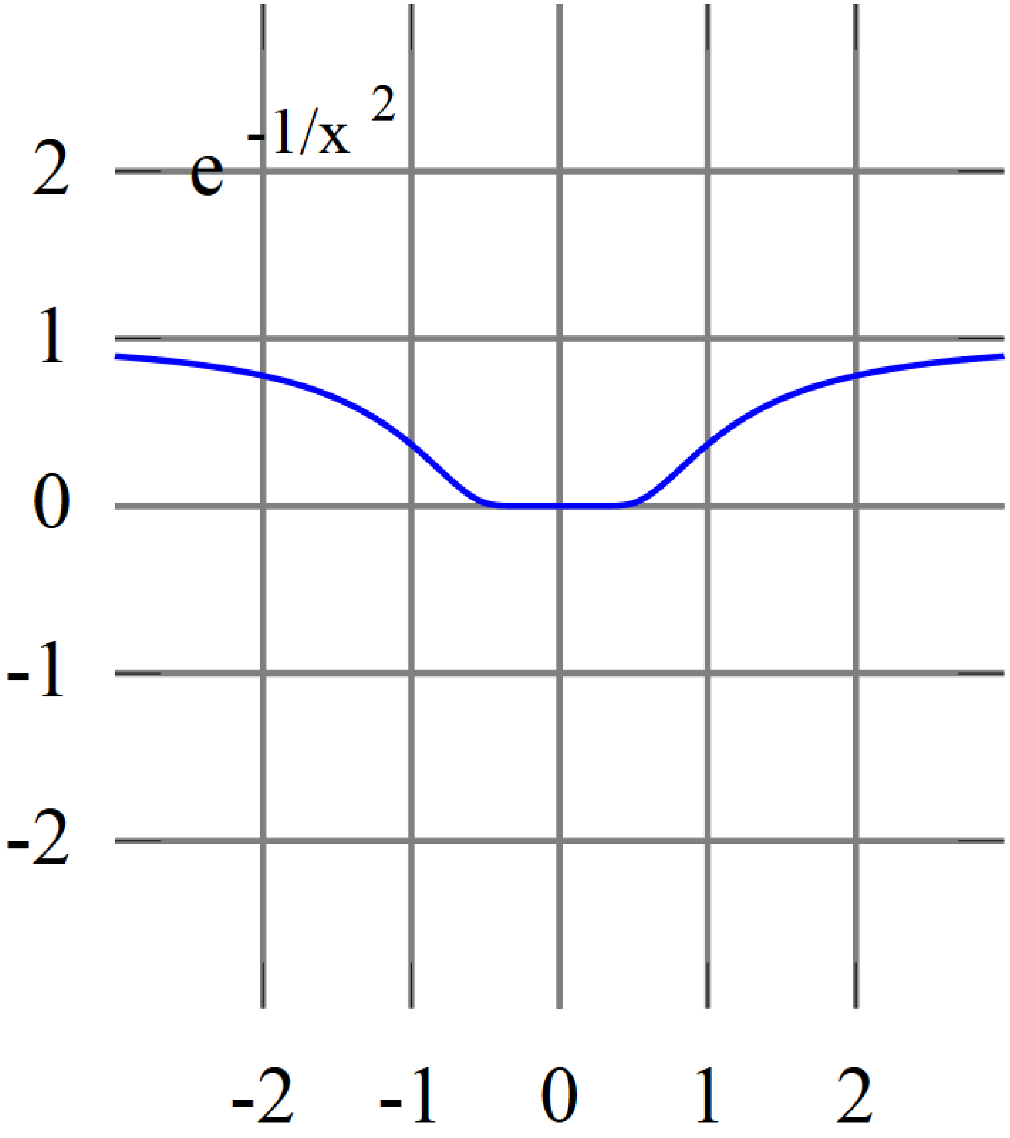


As the degree of the Taylor polynomial rises, it approaches the correct function. This image shows sin(x) and its Taylor approximations, polynomials of degree 1, 3, 5, 7, 9, 11 and 13.



The Taylor polynomials for log(1 + *x*) only provide accurate approximations in the range $-1 < x \leq 1$. Note that, for $x > 1$, the Taylor polynomials of higher degree are ***worse*** approximations.

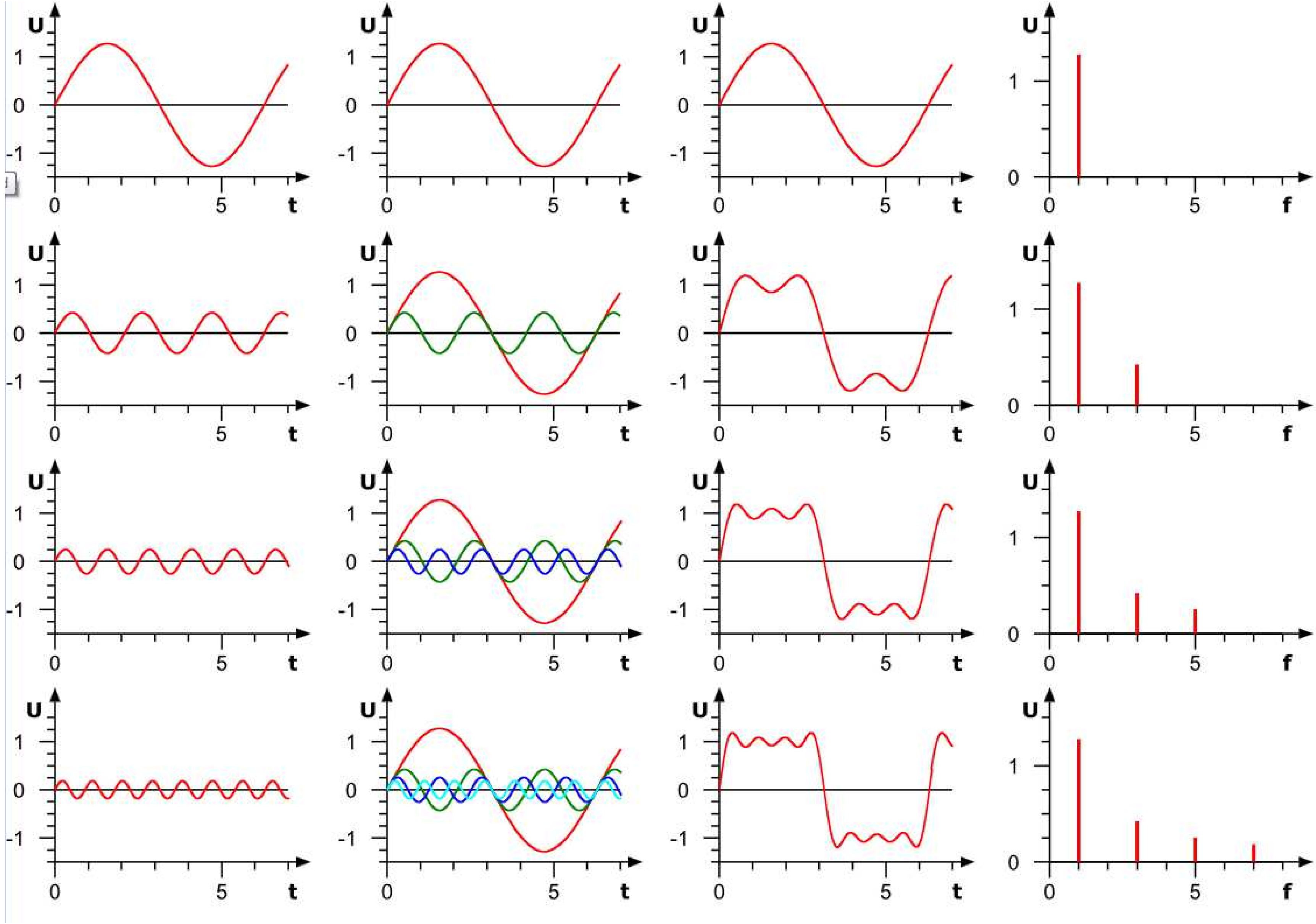
https://en.wikipedia.org/wiki/Taylor_series



The function e−1/x² is not analytic at $x = 0$: the Taylor series is identically 0, although the function is not.

Fourier-Transformation

Siehe auch mathematischer Anhang (Kap. 13) im Demtröder-Buch



https://de.wikipedia.org/wiki/Rechteckschwingung
„Fourier synthesis“ von René Schwarz - Eigenes Werk, SVG Version of File:Fouriersynthese.png. Lizenziert unter CC BY-SA 3.0 über Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Fourier_synthesis.svg#/media/File:Fourier_synthesis.svg

Fourierreihe einer Rechteckschwingung

Originalfunktion

$$f(t) := \begin{cases} 1 & \text{falls} \quad t \in [0,\pi) \\ -1 & \text{falls} \quad t \in [\pi, 2\pi). \end{cases}$$

Fourierkoeffizienten

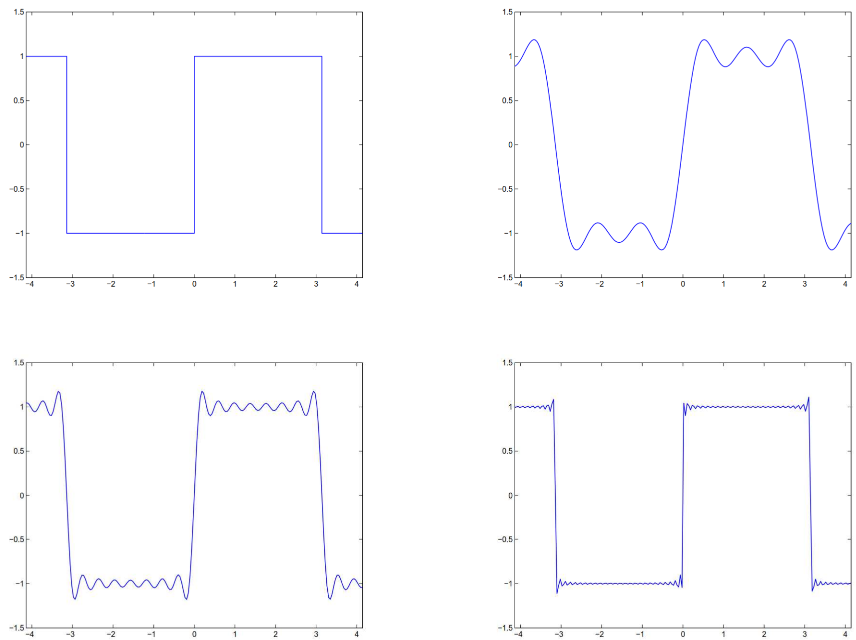
$$a_k = 0.$$

$$b_k = \begin{cases} 4/(k\pi) & \text{falls} \quad k \text{ ungerade} \\ 0 & \text{falls} \quad k \text{ gerade.} \end{cases}$$

Fourierreihe

$$\frac{4}{\pi}\left(\frac{\sin t}{1} + \frac{\sin 3t}{3} + \frac{\sin 5t}{5} + \dots\right)$$

Originalfunktion und Partialsummen für $n = 5, 15, 100$



Fourierreihe einer Sägezahnfunktion

Originalfunktion

$$f(t) = t \text{ auf } [-\pi, \pi)$$

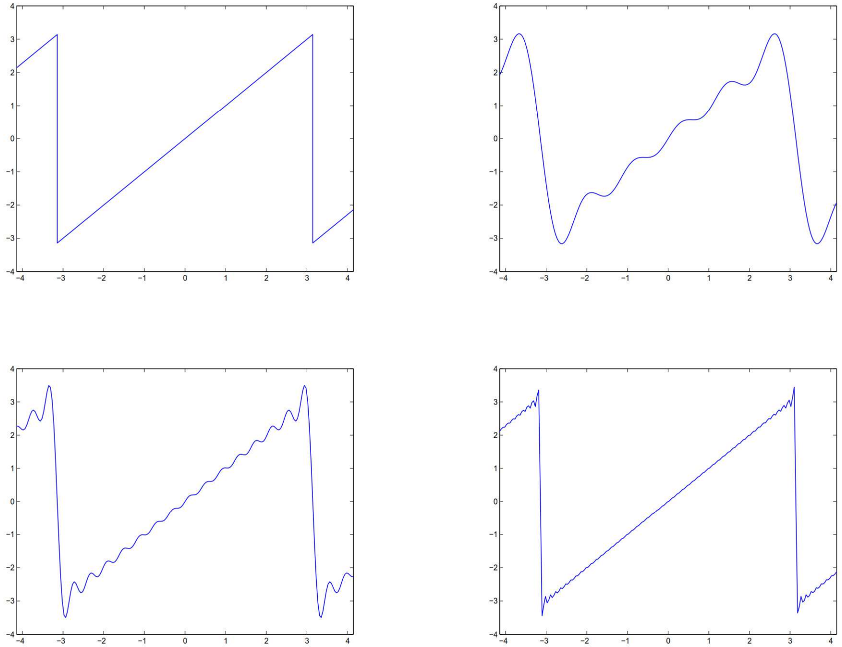
Fourierkoeffizienten

$$a_k = 0,$$
$$b_k = (-1)^{k+1}\frac{2}{k}.$$

Fourierreihe

$$2\left(\frac{\sin t}{1} - \frac{\sin 2t}{2} + \frac{\sin 3t}{3} + \dots\right).$$

Originalfunktion und Partialsummen für $n = 5, 15, 100$



Fourierreihe eines Dreiecksimpulses

Originalfunktion

$$f(t) = \frac{2}{\pi}\,|t| - 1 \text{ auf } [-\pi, \pi)$$

Fourierkoeffizienten

$$a_k = \begin{cases} -\frac{4}{\pi\,k^2} & \text{falls } k \text{ ungerade} \\ 0 & \text{falls } k \text{ gerade} \end{cases}$$

$$b_k = 0.$$

Fourierreihe

$$-\frac{4}{\pi\,k^2}\left(\frac{\cos t}{1} + \frac{\cos 3t}{3^2} + \frac{\cos 5t}{5^2} + \dots\right).$$

Originalfunktion und Partialsummen für $n = 5, 15, 100$