

Zur Fourierreihe der Rechteckfunktion

Fourierreihe:

$$f(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} \left[a_k \cos\left(\frac{2\pi k}{L}x\right) + b_k \sin\left(\frac{2\pi k}{L}x\right) \right]$$

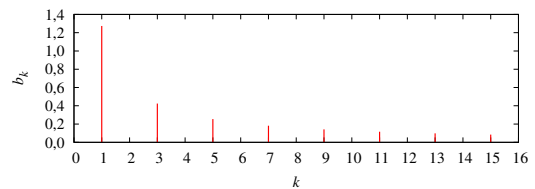
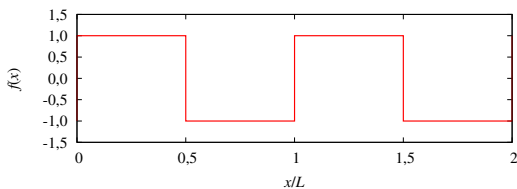
mit

$$a_k = 0, \quad b_k = \begin{cases} \frac{4}{\pi k} & k \text{ ungerade} \\ 0 & k \text{ gerade} \end{cases}$$

oder

$$f(x) = \sum_{k=1}^{\infty} \frac{4}{\pi(2k-1)} \sin\left(\frac{2\pi(2k-1)}{L}x\right)$$

Funktionsverlauf und Koeffizienten im Diagramm :

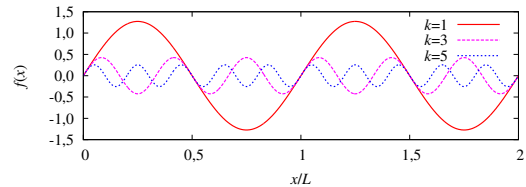


Endliche Reihe:

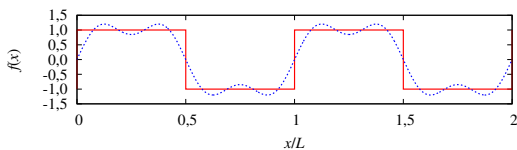
Entwicklung bis N :

$$f(x) \approx \sum_{k=1}^N b_k \sin\left(\frac{2\pi k}{L}x\right)$$

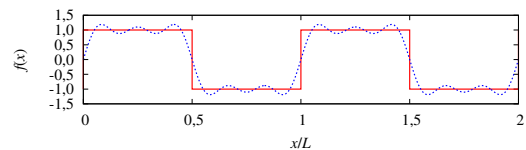
Die ersten drei nichtverschwindenden Komponenten:



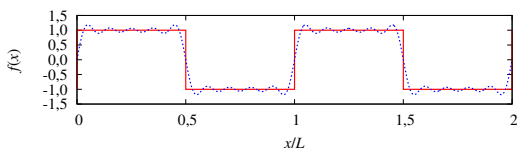
$N = 3$:



$N = 5$:



$N = 9$:



$N = 15$:

