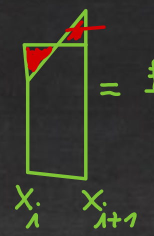
Fourierreihe oder Fourierzerlegung einer Funktion

$$\int_{x_1}^{x_2} f(x)\,dx = A$$



$$= \frac{f(x_{i+1}) + f(x_i)}{2} \cdot (x_{i+1} - x_i)$$

$$f(x_4) \cdot \Delta x$$

$$A = f(x_1) \cdot \Delta x + f(x_2)\Delta x + \ldots f(x_{10})\Delta x$$

$f(x) = x^2 - x^4$; $\int f(x)dx = \int (x^2 - x^4)dx = \frac{x^3}{3} - \frac{x^5}{5} = F(x)$

$$f(x) = \frac{a_0}{2L} + \sum_{i=1}^{n=4} a_i \cos\left(\frac{i\cdot\pi}{L}\cdot x\right) + \sum_{1}^{n=4} b_i \sin\left(\frac{i\cdot\pi}{L}\cdot x\right)$$

$$a_0 = \int_{-L}^{L} f(x)dx$$

$$\int_{-L}^{L} f(x)\cdot\cos\left(\frac{\pi}{L}\cdot x\right)dx = \frac{a_0}{2L}\overbrace{\int_{-L}^{L}\cancel{\cos\left(\frac{\pi}{L}\cdot x\right)dx}}^{=0} + a_1\underbrace{\int_{-L}^{L}\cos\left(\frac{\pi}{L}x\right)\cos\left(\frac{\pi}{L}x\right)dx}_{=1}$$

$$a_1 = \int_{-L}^{L} f(x)\cos\left(\frac{\pi}{L}x\right)dx \quad ; \quad b_1 = \int_{-L}^{L} f(x)\sin\left(\frac{\pi}{L}\cdot x\right)dx$$

$$a_2 = \int_{-L}^{L} f(x)\cdot\cos\left(\frac{2\pi}{L}x\right)dx \quad ; \quad b_2 = \int_{-L}^{L} f(x)\sin\left(\frac{2\pi}{L}x\right)dx$$

$$a_3 = \int_{-L}^{L} f(x)\cos\left(\frac{3\pi}{L}x\right)dx \qquad \vdots$$

$$a_4 = \int_{-L}^{L} f(x)\cos\left(\frac{4\pi}{L}\cdot x\right)dx$$