

Aufgabe 2

$$\int_0^{\pi} \cos(x^2) dx \quad h_j = \frac{b-a}{2^j} \quad j = 0, 1, 2, 3, 4 \quad f(x) = \cos(x^2)$$



T_{00}

$$j=0, h_0 = \frac{b-a}{2^0} = b-a = \pi - 0 = \pi, n=1$$

$$T_{00} = T f(\pi) = h \left(\frac{f(0) + f(\pi)}{2} \right) = \pi \cdot \left(\frac{\cos(0^2) + \cos(\pi^2)}{2} \right) = 0.1529$$

$$j=1, h_1 = \frac{b-a}{2^1} = \frac{\pi}{2}, n=2$$

$$T_{10} = h_1 \cdot \left(\frac{f(0) + f(\pi)}{2} + \sum_{i=1}^1 f\left(0 + i \cdot \frac{\pi}{2}\right) \right) = \frac{\pi}{2} \left(\frac{\cos(0) + \cos(\pi^2)}{2} + \cos\left(\left(\frac{\pi}{2}\right)^2\right) \right) = -1.1507$$

$$j=2, h_2 = \frac{\pi}{4}, n=4$$

$$T_{20} = h_2 \cdot \left(\frac{f(0) + f(\pi)}{2} + \sum_{i=1}^3 f\left(0 + i \cdot \frac{\pi}{4}\right) \right) = \frac{\pi}{4} \left(\frac{\cos(0) + \cos(\pi^2)}{2} + \cos\left(\left(\frac{\pi}{4}\right)^2\right) + \cos\left(\left(\frac{\pi}{2}\right)^2\right) + \cos\left(\left(\frac{3\pi}{4}\right)^2\right) \right) = 0.6498$$

$$j=3, h_3 = \frac{\pi}{8}, n=8$$

$$T_{30} = h_3 \cdot \left(\frac{f(0) + f(\pi)}{2} + \sum_{i=1}^7 f\left(0 + i \cdot \frac{\pi}{8}\right) \right) = \frac{\pi}{8} \left(\frac{\cos(0) + \cos(\pi^2)}{2} + \sum_{i=1}^7 \cos\left(\left(\frac{i\pi}{8}\right)^2\right) \right) = 0.6026$$

$$j=4, h_4 = \frac{\pi}{16}, n=16$$

$$T_{40} = h_4 \cdot \left(\frac{f(0) + f(\pi)}{2} + \sum_{i=1}^{15} f\left(0 + i \cdot \frac{\pi}{16}\right) \right) = \frac{\pi}{16} \left(\frac{\cos(0) + \cos(\pi^2)}{2} + \sum_{i=1}^{15} \cos\left(\left(\frac{i\pi}{16}\right)^2\right) \right) = 0.5745$$

$$T_{01} = -1.5852$$

$$T_{02} = 1.439$$

$$T_{11} = 1.2500$$

$$T_{12} = 0.5427$$

$$T_{21} = 0.5869$$

$$T_{31} = 0.5651$$

$$T_{22} = 0.5636$$

$$T_{03} = 0.5285$$

$$T_{13} = 0.5639$$

$$\underline{\underline{T_{04} = 0.5640}}$$