$$T_j^{(0)} = h_j \left(\frac{f(a) + f(b)}{2} + \sum_{i=1}^{n_j - 1} f(x_i) \right), \quad h_j = \frac{\pi}{2^j}, \ n_j = 2^j$$

Romberg-Verfahren

$$T_j^{(k)} = T_j^{(k-1)} + \frac{T_j^{(k-1)} - T_{j-1}^{(k-1)}}{4^k - 1}$$

Rechnung für $j = 0 \dots 4$

$j = 0, n_0 = 1, h_0 = \pi$

$$T_0^{(0)} = \frac{\pi}{2} \left(\cos(0^2) + \cos(\pi^2) \right) = 0.0236$$

$j = 1, n_1 = 2, h_1 = \frac{\pi}{2}$

$$T_1^{(0)} = \frac{\pi}{2} \cdot \frac{1}{2} \left(\cos(0^2) + 2\cos\left(\left(\frac{\pi}{2}\right)^2\right) + \cos(\pi^2) \right) = -1.221$$

$j = 2, n_2 = 4, h_2 = \frac{\pi}{4}$

$$T_2^{(0)} = \frac{\pi}{4} \cdot \frac{1}{2} \cdot \left(\cos(0^2) + 2\left(\cos\left(\left(\frac{\pi}{4}\right)^2\right) + \cos\left(\left(\frac{\pi}{2}\right)^2\right) \right) + \cos\left(\left(\frac{3\pi}{4}\right)^2\right) \right) + \cos(\pi^2) \right) = 0.586$$

$j = 3, n_3 = 8, h_3 = \frac{\pi}{8}$

$$T_3^{(0)} = \frac{\pi}{8} \cdot \left(\frac{f(0) + f(\pi)}{2} + \sum_{k=1}^{7} f\left(k \cdot \frac{\pi}{8}\right) \right)$$

$j = 4, n_4 = 16, h_4 = \frac{\pi}{16}$

$$T_4^{(0)} = \frac{\pi}{16} \left(\frac{f(0) + f(\pi)}{2} + \sum_{k=1}^{15} f\left(k \cdot \frac{\pi}{16}\right) \right)$$