

0.1 116. Hausaufgabe

0.1.1 Analysis-Buch Seite 257, Aufgabe 19

Berechne:

$$\mathbf{a)} \int_0^1 2x(2+x^2)^2 dx = \int_0^1 (2+x^2)^2 (2+x^2)' dx = \left[\int t^2 dt \right]_0^1 = \left[\frac{1}{3} (2+x^2)^3 \right]_0^1 = \frac{19}{3};$$

$$\mathbf{b)} \int_0^\pi \sin x \cos^3 x dx = \int_0^\pi \cos^3 x \cdot (\cos x)' \cdot (-1) dx = \left[-\int t^3 dt \right]_0^\pi = \left[-\frac{1}{4} \cos^4 x \right]_0^\pi = 0;$$

$$\mathbf{c)} \int_{-1}^1 x e^{-x^2} dx = \int_{-1}^1 e^{-x^2} \cdot \underbrace{(-x^2)'}_{-2x} \cdot \left(-\frac{1}{2}\right) dx = \left[-\frac{1}{2} \int e^t dt \right]_{-1}^1 = \left[-\frac{1}{2} e^{-x^2} \right]_{-1}^1 = 0;$$

$$\mathbf{d)} \int_1^e \frac{\ln x}{x} dx = \int_1^e I(\ln x) \cdot \underbrace{(\ln x)'}_{\frac{1}{x}} dx = \left[\int \underbrace{I(t)}_t dt \right]_1^e = \left[\frac{1}{2} \ln^2 x \right]_1^e = \frac{1}{2} \text{ mit } I(t) = t;$$