BHT Berlin
Technische Informatik
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Sommersemester 2018
Mathematik II

Lösungen zum**12. Übungsblatt**

1. Aufgabe. a)

$$\int \sqrt[m]{x^n}\, dx = \frac{m \cdot \sqrt[m]{x^{n+m}}}{n+m} + C$$

b)

$$\int a^x\, e^x\, dx = \frac{(ae)^x}{1+\ln a} + C$$

c)

$$\int \frac{(1-t)^2}{t\sqrt{t}}\, dt = \frac{2t^2-12t-6}{3\sqrt{t}} + C$$

d)

$$\int \frac{1+\cos^2(t)}{1+\cos(2t)}\, dt = \frac{1}{2}(t+\tan t) + C.$$

2. Aufgabe. a) $\int_0^1 x^2\, dx = \frac{1}{3}$,

b) $\int_0^1 e^x\, dx = e-1$,

c) $\int_0^1 x^k\, dx = \frac{1}{k+1}, \quad k \in N$,

d) $\int_1^2 \frac{1}{x}\, dx = \ln 2$.

3. Aufgabe.

a) $\int_0^1 \sqrt{1+x}\, dx = \frac{4\sqrt{2}-2}{3}$

b) $\int_0^\pi \sin(x)\, dx = 2$

c) $\int_0^1 (e^x-1)^4 e^x\, dx = \frac{1}{5}(e-1)^5$

d) $\int_1^2 \frac{1}{x+x^3} dx, = \ln(\frac{2\sqrt{2}}{\sqrt{5}})$

e) $\int_0^1 x\, e^{-x}\, dx = 1-2e^{-1}$

f) $\int_0^2 x \log_2(x)\, dx = -\frac{2+\ln 2}{2\ln 2}$

g) $\int_0^{e-1} \ln(x+1)\,dx = 1$

h) $\int_4^9 \frac{\sqrt{x}}{\sqrt{x}-1}\,dx = 7 + 2\ln 2$

i) $\int_0^1 \frac{\sqrt{e^x}}{\sqrt{e^x+e^{-x}}}\,dx = \ln\frac{e+\sqrt{e^2+1}}{1+\sqrt{2}}$

4. Aufgabe.

a)

$$\int \frac{dx}{1+\sqrt{1+x}} = 2(\sqrt{x+1} - \ln(1+\sqrt{1+x})) + C$$

b)

$$\int \frac{dx}{\sqrt{1+e^x}} = \ln\frac{\sqrt{1+e^x}-1}{\sqrt{1+e^x}+1} + C$$

c)

$$\int \sqrt{1+\cos^2(t)}\,\sin(2t)\,\cos(2t)\,dt = 0,4(\sqrt{1+\cos^2 t})^3(3-2\cos^2 t) + C$$

d)

$$\int \frac{t^2}{\sqrt{a^2-t^2}}\,dt = \frac{a^2}{2}\arcsin\frac{t}{a} - \frac{t}{2}\sqrt{a^2-t^2} + C$$

e)

$$\int \frac{y^5\,dy}{(y^2-4)^2} = \frac{1}{2}(y^2-4) + 4\ln|y^2-4| - \frac{8}{y^2-4} + C$$

f)

$$\int \frac{\sqrt{1+\ln(y)}}{y\,\ln(y)}\,dy = 2\sqrt{1+\ln y} + \ln|\ln y| - 2\ln|\sqrt{1+\ln y}+1| + C$$