

Mathe-Tutorat - Lösungen

Blatt 1: Aufgabe 1

- $F(x) = 1/2 \exp(2x) + 6/5x^{5/2}$
- $F(x) = -1/4x^{-4} + 0,25x^{-2} - 2/7x^{7/2}$
- $F(x) = 2/5x^5 - 3/2x^2$
- $F(x) = 8/3x^3 + 1/3 \exp(3x)$

Aufgabe 2

$$\left(\frac{1}{a}F(ax+b) + C\right)' = \frac{a}{a}f(ax+b).$$

Aufgabe 3

$$(i) \int x^2 \exp(2x) dx = [1/2x^2 \exp(2x)] - \int x \exp(2x) dx = [1/2x^2 \exp(2x)] - [1/2x \exp(2x)] + \int 1/2 \exp(2x) dx = [1/2x^2 \exp(2x)] - [1/2x \exp(2x)] + [1/4 \exp(2x)]$$

$$(ii) \int x \ln(x) dx = [1/2x^2 \ln(x)] - \int 1/2x^2 x^{-1} dx = [1/2x^2 \ln(x)] - [1/4x^2]$$

Aufgabe 4

- $e^{x_i} + 8y^{-7}x_i^3(y - y^{1/2} + x_i^4)$
- $\sum_{i=1}^n 2yz(z^3 + 5) - 2y^{-7}(y - y^{1/2} - x_i^4)(1 - 1/2y^{-1/2}) + 7y^{-8}(y - y^{1/2} - x_i^4)^2$
- $\sum_{i=1}^n y^2(4z^3 + 5) = ny^2(4z^3 + 5)$

Aufgabe 5

$$\sum_{n=0}^{\infty} q^n = \frac{1}{1-q} \Leftrightarrow (1-q) \sum_{n=0}^{\infty} q^n = 1 \Leftrightarrow \sum_{n=0}^{\infty} q^n - \sum_{n=1}^{\infty} q^n = 1 \Leftrightarrow 1 = 1.$$

Aufgabe 6

$$f'(x) = 3(x^2 - 2xy)^2(2x - 2y)(\exp(x^2 - x^{1/2})^{-3/7} - 3/7(x^2 - 2xy)^3(\exp(x^2 - x^{1/2})^{-10/7}(2x \exp(x^2) - 1/2x^{-1/2}))$$

$$g'(x) = -x^{-1}(x^2 - 5)^3 - 6x \ln(x)(x^2 - 5)^2 + \exp(x)(\ln(x) + 1/x)$$

Blatt 2: Aufgabe 1

- $a = 2$
- $a = 5$
- $1 = \int_0^3 a 2^x dx = \int_0^3 a (\exp(\ln 2))^x dx = \int_0^3 a \exp(x \ln 2) dx = a \left[\frac{1}{\ln 2} \exp(x \ln 2) \right]_0^3 \Leftrightarrow$
 $a = \frac{1}{\left[\frac{1}{\ln 2} \exp(x \ln 2) \right]_0^3}$
- $1 = \int_0^3 a x^2 dx = a \left[\frac{1}{3} x^3 \right]_0^3 \Leftrightarrow a = \frac{1}{\left[\frac{1}{3} x^3 \right]_0^3}$

Aufgabe 3

- $f'(x) = 14x, F(x) = 7x^2 + \frac{7}{3}x^3$
- $f'(t) = y^3, F(t) = \frac{1}{2}t^2 y^3 + t \ln(x - 8)^4$
- $f'(z) = 8dz^{8d-1}, F(z) = \frac{1}{8d+1}z^{8d+1}$
- $f'(y) = 4 \exp(4y), F(y) = \frac{\exp(4y)}{4} + 5y$