

# ALA BLATTNR. 05 08.05.2014

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1. **TODO**

2. **TODO**

3. a)

Umformen:

$$f(x) = (x + 1)^{x+2} = e^{\ln(x+1)^{x+2}} = e^{\ln(x+1)(x+2)}$$

Differenzieren:

$$\begin{aligned} f'(x) &= \left( e^{\ln(x+1)(x+2)} \right)' \\ &= e^{\ln(x+1)(x+2)} \cdot ((x+2) \cdot \ln(x+1))' \\ &= e^{\ln(x+1)(x+2)} \cdot \left( x \cdot \ln(x+1) + (x+2) \cdot \frac{1}{(x+1)} \right) \\ &= (x+1)^{x+2} \cdot \left( x \cdot \ln(x+1) + \frac{x+2}{(x+1)} \right) \end{aligned}$$

b) (i)

Umformen:

$$g(x) = (x^2 + 5)^{x^4+3} = e^{\ln(x^2+5)^{x^4+3}} = e^{(x^4+3) \cdot \ln(x^2+5)}$$

Differenzieren:

$$\begin{aligned} g'(x) &= \left( e^{(x^4+3) \cdot \ln(x^2+5)} \right)' \\ &= e^{(x^4+3) \cdot \ln(x^2+5)} \cdot \left( (x^4+3) \cdot \ln(x^2+5) \right)' \\ &= e^{(x^4+3) \cdot \ln(x^2+5)} \cdot \left( 4x^3 \cdot \ln(x^2+5) + (x^4+3) \cdot \frac{2x}{x^2+5} \right) \\ &= (x^2+5)^{x^4+3} \cdot \left( 4x^3 \cdot \ln(x^2+5) + \frac{2x^5+6x}{x^2+5} \right) \end{aligned}$$

(ii)

Umformen:

$$h(x) = (x^4 + 3)^{\sqrt{3x+1}} = e^{\ln(x^4+3)^{\sqrt{3x+1}}} = e^{\sqrt{3x+1} \cdot \ln(x^4+3)}$$

Differenzieren:

$$\begin{aligned} h'(x) &= e^{\sqrt{3x+1} \cdot \ln(x^4+3)} \\ h'(x) &= e^{\sqrt{3x+1} \cdot \ln(x^4+3)} \cdot \left( \sqrt{3x+1} \cdot \ln(x^4+3) \right)' \\ &= e^{\sqrt{3x+1} \cdot \ln(x^4+3)} \cdot \left( (\sqrt{3x+1})' \cdot \ln(x^4+3) + \sqrt{3x+1} \cdot \frac{4x^3}{x^4+3} \right) \\ &= (x^4+3)^{\sqrt{3x+1}} \cdot \left( \frac{3}{2\sqrt{1+3x}} \cdot \ln(x^4+3) + \frac{4x^3\sqrt{3x+1}}{x^4+3} \right) \end{aligned}$$

c)

Umformen:

$$f(x) = 3^x = e^{\ln(3^x)} = e^{x \cdot \ln 3}$$

Differenzieren:

$$\begin{aligned} f'(x) &= (e^{x \cdot \ln 3})' \\ &= e^{x \cdot \ln 3} \cdot (x \cdot \ln 3)' \\ &= e^{x \cdot \ln 3} \cdot \left( 1 \cdot \ln 3 + x \cdot \frac{0}{3} \right) \\ &= 3^x \cdot (\ln 3) \end{aligned}$$

Umformen:

$$f(x) = x^{\frac{1}{3}} = e^{\ln(x^{\frac{1}{3}})} = e^{\frac{1}{3} \cdot \ln x}$$

Differenzieren:

$$\begin{aligned} f'(x) &= (e^{\frac{1}{3} \cdot \ln x})' \\ f'(x) &= e^{\frac{1}{3} \cdot \ln x} \cdot \left( \frac{1}{3} \cdot \ln x \right)' \\ &= e^{\frac{1}{3} \cdot \ln x} \cdot \left( \ln x + \frac{1}{3} \cdot \frac{1}{x} \right) \\ &= x^{\frac{1}{3}} \cdot \left( \ln x + \frac{\frac{1}{3}x}{x} \right) \end{aligned}$$

4. (ii)  $f'(x) = \cos(x^2) \cdot 2x$   
(iii)  $f'(x) = 2 \cdot \sin(x) \cdot \cos(x)$   
(iv)  $f'(x) = \cos(2x)$   
(v)  $f'(x) = \frac{1}{2\sqrt{-(-1+x)x}}$   
(vi)  $f'(x) = (x^3 - 1)^{\arctan(x)} \cdot \frac{1}{1+x^2} \cdot \ln(x^3 - 1) + \arctan(x) \cdot \left(\frac{1}{x^3-1} \cdot 3x^2\right)$

5. **TODO**

6. **TODO**