## Lösung A1

a) $f'(x) = 2x \cdot (sin(2x) + xcos \cdot (2x))$ $f''(x) = (2 - 4x^3)sin(2x) + 8xcos(2x)$

b) $f'(x) = \frac{4x \cdot (x-3)}{(x-1)^2 \cdot (x+3)^2}$ $f''(x) = -\frac{4(2x^3-9x^2-9)}{(x-1)^3 \cdot (x+3)^3}$

c) $f'(x) = \frac{x+1}{(1+2x)^{\frac{3}{2}}}$ $f''(x) = -\frac{x+2}{(1+2x)^{\frac{5}{2}}}$

d) $f'(x) = e^x \cdot (sin(x) + cos(x))$ $f'(x) = 2e^x \cdot cos(x)$

e) $f'(x) = n \cdot a^{nx} \cdot ln(a)$ $f''(x) = n^2 \cdot a^{nx} \cdot ln^2(a)$

f) $f'(x) = x^4 \cdot (5 \cdot ln(x) + 1)$ $f''(x) = x^3 \cdot (20 \cdot ln(x) + 9)$

## Lösung A2

a) $f'(x) = \frac{1}{(x-1)^2}$ $f''(x) = -\frac{2}{(x-1)^3}$

b) $f'(x) = \frac{x^2(2x-3)}{(x-1)^2}$ $f''(x) = \frac{2x(x^2-3x+3)}{(x-1)^3}$

c) $f'(x) = -\frac{n \cdot x^{n-1}}{2 \cdot \sqrt{1-x^n}}$ $f''(x) = \frac{n \cdot x^{n-2}(x^n(n-2)-2n+2)}{4(1-x^n)^{\frac{3}{2}}}$

d) $f'(x) = \frac{e^{tanx}}{\cos^2(x)}$ $f''(x) = \frac{e^{tanx}(2\tan(x) \cdot \cos^2(x)+1)}{\cos^4(x)}$

e) $f'(x) = 2 \cdot p^{2x} \cdot ln(p)$ $f''(x) = 4 \cdot p^{2x} \cdot ln^2(p)$

f) $f'(x) = -\frac{\sqrt[k]{(1-x)^{1-k}}}{k}$ $f''(x) = \frac{\left(\frac{1}{k}-1\right) \cdot \sqrt[k]{(1-x)^{1-2k}}}{k}$

## Lösung A3

a) $f_a'(x) = \frac{ax(ax+2b)}{(ax+b)^2}$ $f_a''(x) = \frac{2ab^2}{(ax+b)^3}$

b) $f'(x) = -\frac{x^2-8x-2}{(x^2+2)^2}$ $f''(x) = \frac{2(x^3-12x^2-6x+8)}{(x^2+2)^3}$

c) $f'(x) = \frac{x^2-8x-2}{(x-4)^2}$ $f''(x) = \frac{36}{(x-4)^3}$

d) $f'(x) = -\frac{2x^3-6x^2-7}{(x^3+3x+1)^2}$ $f''(x) = \frac{6(x^5-4x^4-x^3-8x^2+2x-7)}{(x^3+3x+1)^3}$

e) $f'(x) = \frac{x \cdot e^x}{(x+1)^2}$ $f''(x) = \frac{(x^2+1) \cdot e^x}{(x+1)^3}$

f) $f'(x) = \frac{x(2\,sin(x)-xcos(x))}{sin^2(x)}$

$f''(x) = \frac{(x^2+2)\,sin^2(x)-4xcos(x)\,\sin(x)+2x^2cos^2(x))}{sin^3(x)}$

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