S 120 Nr. 1

$(6a\sqrt{x})' = (6a \cdot x^{1/2})' = 6a \cdot \frac{1}{2} \cdot x^{-1/2}$

$= 6a \cdot \frac{1}{2} \cdot \frac{1}{x^{1/2}} = \frac{6a}{2 \cdot \sqrt{x}}$

$$\left.\begin{array}{l} \lim\limits_{x \to 1^+} (2ax^2 - 35x) = 2a - 35 \\ \lim\limits_{x \to 1^-} (6a\sqrt{x} - 30) = 6a - 30 \end{array}\right\} \text{I} \quad \boxed{2a - 35 = 6a - 30}$$

stetig

$$\left.\begin{array}{l} \lim\limits_{x \to 1^+} (4ax - 35) = 4a - 35 \\ \lim\limits_{x \to 1^-} \left(\frac{6a}{2\sqrt{x}}\right) = 3a \end{array}\right\} \text{II} \quad \boxed{4a - 35 = 3a}$$

differenzierbar

$$\begin{array}{l|l|} \text{I} & -4a - 35 = -30 \\ \text{II} & a - 35 = 0 \end{array}$$

$a = 35$

$-125 - 35 = -30$

$-155 = -30$

$5 = 2$

$a = 6$

2) a) $f(x) = 4 \cdot \sqrt[3]{2} \cdot x^{2/3} + 5 \cdot x^{3/5}$

$f'(x) = 4 \cdot \sqrt[3]{2} \cdot \frac{2}{3} \cdot x^{-1/3} + 5 \cdot \frac{3}{5} \cdot x^{-2/5}$

$= \frac{8}{3} \cdot \sqrt[3]{2} \cdot x^{-1/3} + 3 \cdot x^{-2/5}$

$f''(x) = 8/3 \cdot \sqrt[3]{2} \cdot (-1/3) \cdot x^{-4/3} + 3 \cdot (-2/5) \cdot x^{-7/5}$

$= -\frac{8}{9} \cdot \sqrt[3]{2} \cdot x^{-4/3} - 6/5 \cdot x^{-7/5}$

b) $f(x) = 4 \cdot x^{-3/2} - 2 \cdot x^{3/2}$

$\frac{4 \cdot x \cdot \sqrt{x}}{x^3} = 4 \cdot x^1 \cdot x^{1/2} \cdot x^{-3}$

$4 \cdot x^{1+1/2-3}$

$f'(x) = 4 \cdot (-3/2) \cdot x^{-5/2} - 2 \cdot 3/2 \cdot x^{1/2}$

$= -6 \cdot x^{-5/2} - 3 \cdot x^{1/2}$

$f''(x) = -6 \cdot (-5/2) \cdot x^{-7/2} - 3 \cdot 1/2 \cdot x^{-1/2}$

$= 15 \cdot x^{-7/2} - 3/2 \cdot x^{-1/2}$

3) a) $f(x) = 4x - 30x^3 + x^5$

$$f(-x) = -4x + 30x^3 - x^5$$

$$-f(-x) = -[-4x + 30x^3 - x^5) = 4x - 30x^3 + x^5$$

$$\begin{tikzcd}[column sep=small]
 & f(x) = f(-x) \arrow[dl, "J"'] \arrow[dr, "N"] & & \\
\text{Achsen} & & f(x) = -f(-x) \arrow[dl, "J"'] \arrow[dr, "N"] & \\
 & \text{Punkt} & & \emptyset
\end{tikzcd}$$

$$f'(x) = 4 - 90x^2 + 5x^4$$
$$f''(x) = -180x + 20x^3 = 0$$
$$= 20x(-9 + x^2) = 0$$

$$\underbrace{x_1 = 0 \ ; \ x_2 = 3 \ , \ x_3 = -3}_{\underline{\text{Wendestellen}}}$$

3)5)

$$\left.\begin{aligned} f(x) &= -0{,}5\,x^4 + 12x^2 + 8 \\ f(-x) &= -0{,}5\,(-x)^4 + 12(-x)^2 + 8 \end{aligned}\right\} = \quad \rightarrow \underline{\text{Achsym.}}$$

$$f'(x) = -2x^3 + 24x$$

$$f''(x) = -6x^2 + 24 = 0$$

$$6x^2 = 24$$

$$x^2 = 4 \quad \Rightarrow \quad x_{1/2} = \pm 2$$

4)a)

$$f'(x) = \frac{1}{2\sqrt{x}} \cdot \cos x + \sqrt{x} \cdot (-\sin x)$$

$$= \frac{\cos(x)}{2\sqrt{x}} - \sqrt{x} \cdot \sin x$$

5)

$$f(x) = \frac{3 \cdot \sqrt[3]{x} + 5}{2 \cdot \sqrt{x^3}} = \frac{3}{2} \cdot x^{1/3} \cdot x^{-3/2} = \frac{3}{2} \cdot x^{-\frac{7}{6}}$$

$$f'(x) = \frac{3}{2} \cdot \left(-\frac{7}{6}\right) \cdot x^{-13/6} = -\frac{7}{4} \cdot \frac{1}{\sqrt[6]{x^{13}}}$$

(1-5 . 3)

$$f(x) = 3 \cdot [\cos(2x) \cdot \underbrace{\cos(\pi)}_{-1} + \sin(2x) \cdot \underbrace{\sin(\pi)}_{0} + 2]$$

$$f(x) = -3 \cdot \cos(2x) + 6$$

<u>Wertebereich</u>: $-3 \cdot [-1; 1] + 6 = [-3; 3] + 6$

$$y \in [3; 9]$$

<u>Periode</u>: $P_{neu} = \frac{2\pi}{2} = \pi \Rightarrow f(x) = f(x + \pi)$

$$-3 \cdot \cos(2 \cdot (x + \pi)) + 6 = -3 \cos(2x + 2\pi) + 6$$

$$-3 \cdot [\cos(2x) \cdot \underbrace{\cos(2\pi)}_{1} - \sin(2x) \cdot \underbrace{\sin(2\pi)}_{0}] + 6$$

$$-3 \cdot \cos(2x) + 6 = f(x)$$

Symmetrie:

$f(x) = f(-x)$

$-3 \cdot \cos(2x) + 6 = -3 \cdot \cos(-2x) + 6 \quad | -6 \cdot (-\frac{1}{3})$

$\cos(2x) = \cos(-2x)$) $2x = \alpha$

$\cos(\alpha) = \cos(-\alpha)$ ✓