S 120 Nr. 1

$$\left.\begin{array}{l}\lim\limits_{x\to 1^+} f(x) = 2a - 3b \\[2ex] \lim\limits_{x\to 1^-} f(x) = 6a - 30\end{array}\right\} \Rightarrow \begin{array}{rl} -4a - 3b &= -30 \\ -15b &= -30 \\ b &= 2 \end{array}$$

$$\left.\begin{array}{l}\lim\limits_{x\to 1^+} f'(x) = \lim\limits_{x\to 1^+} 4ax - 3b = 4a - 3b \\[2ex] \lim\limits_{x\to 1^-} f'(x) = \lim\limits_{x\to 1^-} \dfrac{3a}{\sqrt{x}} = 3a\end{array}\right\} \Rightarrow \begin{array}{rl} a &= 3b \\ a &= 6 \end{array}$$

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

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

$f''(x) = -\frac{8}{9}\sqrt[3]{2}\, x^{-4/3} - \frac{6}{5}\, x^{-7/5}$

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

$= 4x^{-3/2} - 2x^{3/2}$

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

$f''(x) = 15x^{-7/2} - \frac{3}{2} x^{-1/2} = \frac{15}{\sqrt{x^7}} - \frac{3}{2\sqrt{x}}$

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

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

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

Punktsymmetrie

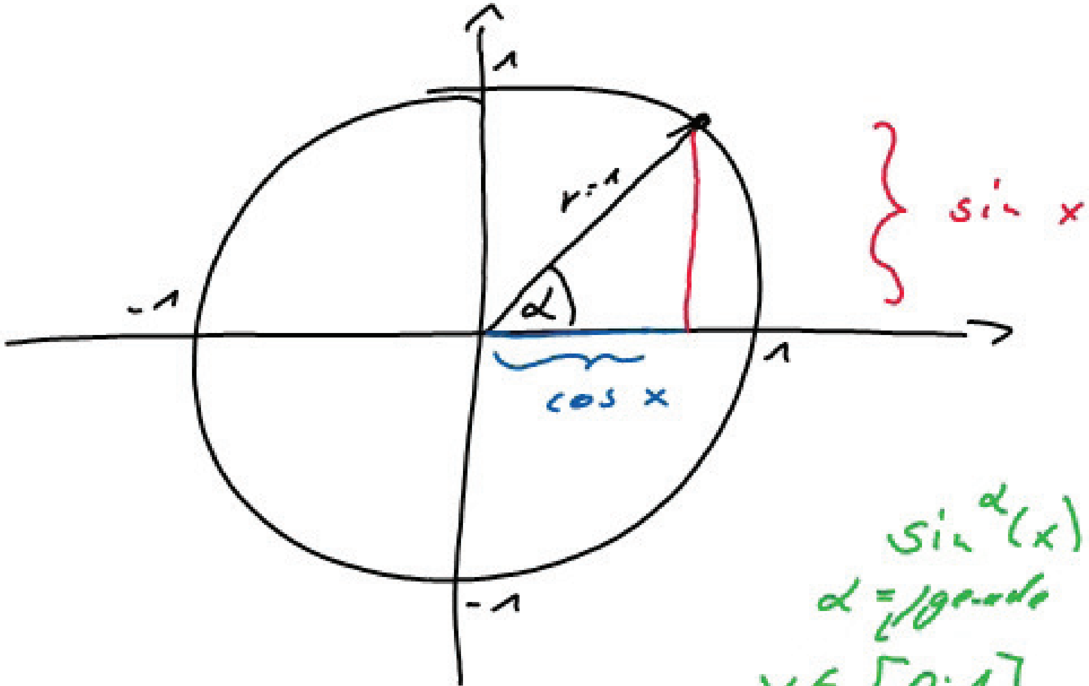
5) $\left.\begin{aligned} f(+x) &= 12x^2 - \tfrac{1}{2}x^4 + 8 \\ f(-x) &= 12(-x)^2 - \tfrac{1}{2}(-x)^4 + 8 \\ &= 12x^2 - \tfrac{1}{2}x^4 + 8 = f(x) \end{aligned}\right\}$ Achsensymmetrie

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

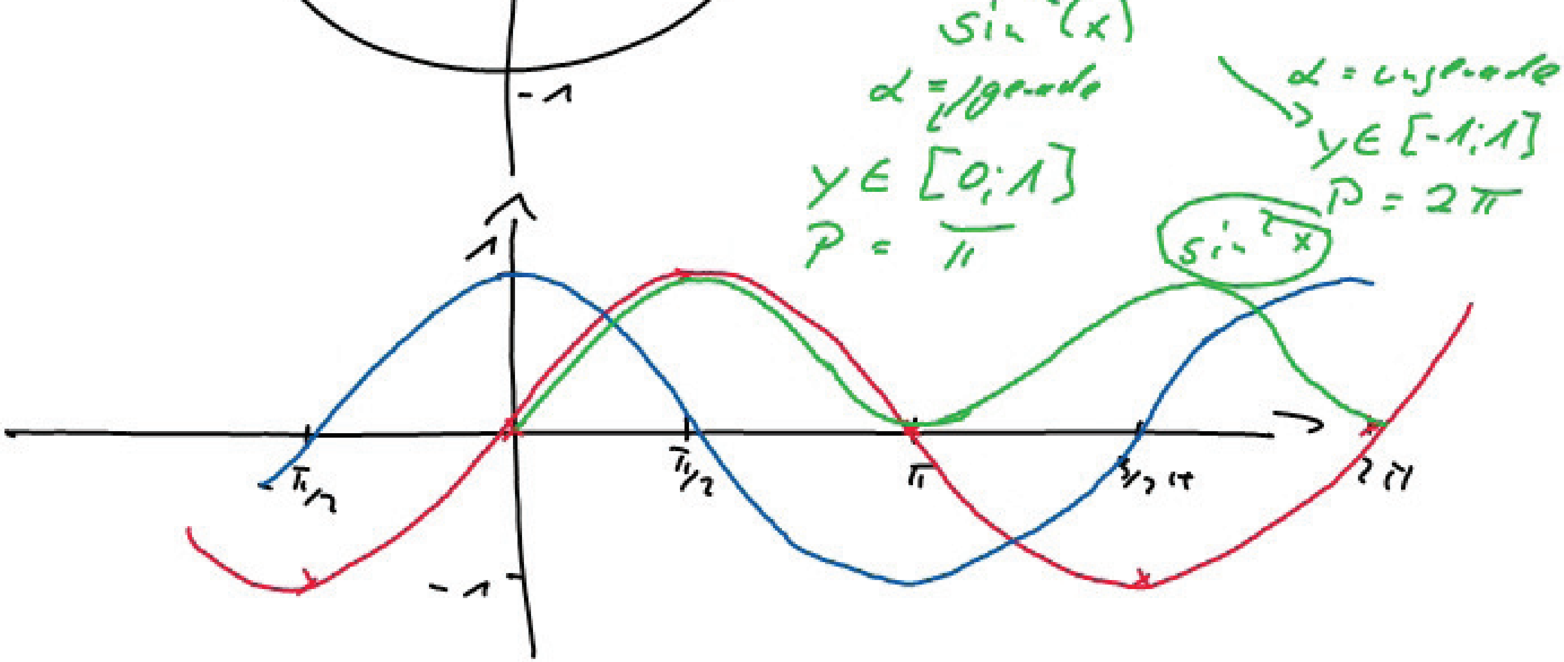
$$= \frac{\cos x}{2\sqrt{x}} - \sqrt{x} \cdot \sin(x)$$

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

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



1
-1
1
-1
r = 1
α
sin x
cos x



sin^α(x)
α = gerade
y ∈ [0;1]
P = π
α = ungerade
y ∈ [-1;1]
P = 2π
sin² x
1
-1
-π/2
π/2
π
3/2 π
2π

S 125 Nr. 3

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

$$h(x) = -3 \cdot \cos^{1}(2x) + 6$$

Wertebereich: $-3 \cdot [-1; 1] + 6 = [-3; 3] + 6 \Rightarrow y \in [3; 9]$

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

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

$$= -3 \cdot \underbrace{\cos(2x + 2\pi)}_{\cos(2x) \cdot \underline{\cos(2\pi)} - \sin(2x) \cdot \overbrace{\sin(2\pi)}^{0}} + 6$$

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

Symmetrie: $f(x) = f(-x)$

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

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

$\cos(-\alpha) = \cos \alpha$ ✓