S. 133 Nr. 1) a) $f(x) = 4 - 3 \cdot \cos(\frac{1}{3}x - 4{,}5\pi) - 4$

$$f(x) = -3 \cdot \cos(\frac{1}{3}x - 4{,}5\pi)$$

<u>Vereinfachung</u>: $-3 \cdot [\cos(\frac{1}{3}x) \cdot \underbrace{\cos(4{,}5\pi)}_{0} + \sin(\frac{1}{3}x) \cdot \underbrace{\sin(4{,}5\pi)}_{1}]$

$$f(x) = -3 \cdot \sin(\frac{1}{3}x)$$

<u>Wertebereich</u>: $-3 \cdot [-1; 1] \Rightarrow y \in [-3; 3]$

<u>Periode</u>: $P = \frac{2\pi}{1/3} = 6\pi \Rightarrow f(x) = f(x + 6\pi)$

$$f(x+6\pi) = -3 \cdot \sin(\frac{1}{3}(x+6\pi)) = -3 \cdot \sin(\frac{1}{3}x + 2\pi)$$

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

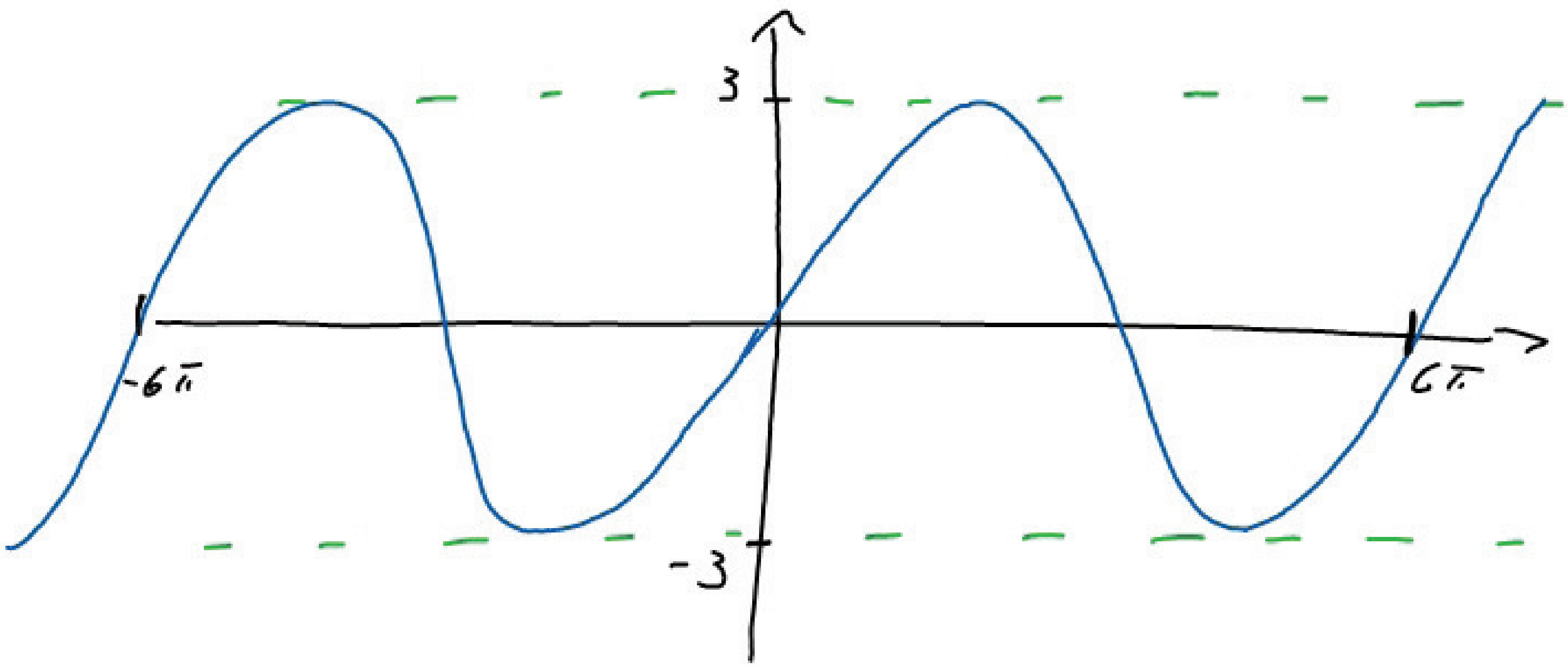
$$= -3 \cdot \sin(\frac{1}{3}x) = f(x) \checkmark$$

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

$$-3\sin(\tfrac{1}{3}x) = -(3\sin(-\tfrac{1}{3}x) = 3 \cdot \sin(-\tfrac{1}{3}x) \quad | \cdot (\tfrac{1}{3})$$

$$\sin(\tfrac{1}{3}x) = \sin(-\tfrac{1}{3}x) \quad (\tfrac{1}{3}x = \alpha$$

$$\sin(\alpha) = \sin(-\alpha)$$



5) $g(x) = -3 \cdot \left[\cos\left(4x + \tfrac{3}{2}\pi\right)\right]^4 - 2$

$= -3 \cdot \left[\cos(4x) \cdot \underbrace{\cos\left(\tfrac{3}{2}\pi\right)}_{\to 0} - \sin(4x) \cdot \underbrace{\sin\left(\tfrac{3}{2}\pi\right)}_{-1}\right]^4 - 2$

$= -3 \cdot \left[(-1) \cdot \sin(4x)\right]^4 - 2 = -3 \cdot \sin^4(4x) - 2$

Wertebereich: $-3 \cdot [0; 1] - 2 = [0; -3] - 2 \Rightarrow y \in [-5; -2]$

Periode: $p = \frac{\pi}{4}$ $\qquad f(x) = f(x + \pi/4)$

$-3 \cdot \left[\sin\left(4\left(x + \pi/4\right)\right)\right]^4 - 2 = -3 \cdot \left[\sin(4x + \pi)\right]^4 - 2$

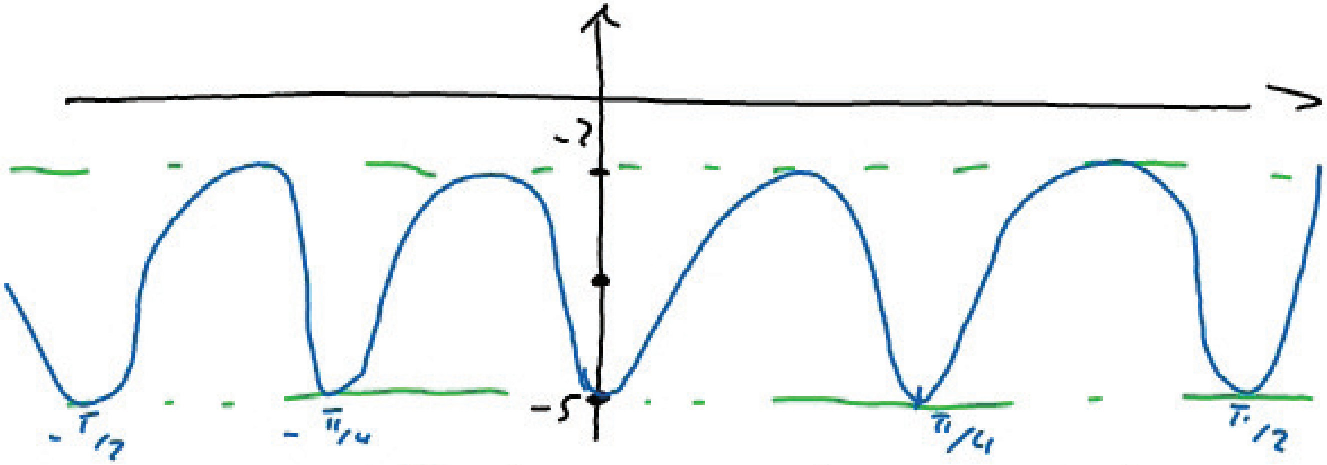
$-3 \cdot \left[\sin(4x) \cdot \underbrace{\cos(\pi)}_{(-1)} + \cos(4x) \cdot \underbrace{\sin(\pi)}_{\to 0}\right]^4 - 2$

$-3 \cdot \left[-\sin(4x)\right]^4 - 2 = -3 \cdot \sin^4(4x) - 2 = f(x)$ ✓

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

$$-3 \cdot \sin^4(4x) - 2 = -3 \cdot \underbrace{\sin^4(-4x)} - 2$$

$$[-\sin(4x)]^4 = \sin^4(4x)$$



$f(x) = \begin{matrix}\sin^\alpha \\ \cos^\alpha\end{matrix}(x)$

	$\alpha \hat{=}$ gerade	$\alpha \hat{=}$ ungerade
$\sin^\alpha(x)$	$y \in [0;1]$ $P = \pi$ $f(x) = f(-x)$	$y \in [-1;1]$ $P = 2\pi$ $f(x) = -f(-x)$
$\cos^\alpha(x)$	$y \in [0;1]$ $P = \pi$ $f(x) = f(-x)$	$y \in [-1;1]$ $P = 2\pi$ $f(x) = f(-x)$

2) a) $h(x) = \ln(x^2 - 9) + 3 \cdot x^{-1}$

$$h'(x) = \frac{2x}{x^2 - 9} - 3 \cdot x^{-2}$$

b) $k(x) = 42 \cdot (x^2 - 8x + 12)^{-1/4}$

$$k'(x) = 42 \cdot (-1/4) \cdot (x^2 - 8x + 12)^{-5/4} \cdot (2x - 8)$$

$$= \frac{21 \cdot (2x-8)}{2 \cdot \sqrt[4]{(x^2 - 8x + 12)^5}}$$

c) $l(x) = 2 \cdot e^{\sqrt{3x-2} + \sin(\sqrt{2-x})}$

$$l'(x) = \left(2 \cdot e^{\sqrt{3x-2} + \sin(\sqrt{2-x})} \cdot \frac{3}{2 \cdot \sqrt{3x-2}} + \cos\sqrt{2-x} \cdot \frac{-1}{2\sqrt{2-x}} \right)$$

S. 138 Nr. 1) a) $F(x) = \frac{3}{2}x^2 - 2x^3 - x^5 + 12x + C$

b) $g(x) = 7x^{-2} - 3x^{-4} - x^{-1}$

$G(x) = -7x^{-1} + x^{-3} - \ln x + c$

2) $g(x) = -(x^2 + 3x + 2) = -(x+2)(x+1)$

$$\int_{-2}^{-1} (-x^2 - 3x - 2)\,dx = \Big|\underbrace{-\tfrac{1}{3}x^3 - \tfrac{3}{2}x^2 - 2x}_{F(x)}\Big|_{-2}^{-1}$$

$$\left.\begin{aligned} F(-1) &= \tfrac{1}{3} - \tfrac{3}{2} + 2 = \frac{2 - 9 + 12}{6} = \tfrac{5}{6} \\ F(-2) &= \tfrac{8}{3} - \tfrac{12}{2} + 4 = \frac{16 - 36 + 24}{6} = \tfrac{4}{6} \end{aligned}\right\} \underbrace{F(-1) - F(-2)}_{\frac{1}{6}\ \text{FE}}$$

3) a) $\int_1^4 (x^2+2x-8)\,dx = \int_1^2 (x^2+2x-8)\,dx + \int_2^4 (x^2+2x-8)\,dx$

$(x^2+2x-8) = (x+4)\underline{(x-2)} = 0$

$F(x) = \frac{1}{3}x^3 + x^2 - 8x$

$F(1) = \frac{1}{3} + 1 - 8 = -\frac{20}{3}$

$F(2) = \frac{8}{3} + 4 - 16 = -\frac{28}{3}$

$F(4) = \frac{64}{3} + 16 - 32 = \frac{16}{3}$

$F(2) - F(1) \quad + |F(4) - F(2)|$

$\left| \left(-\frac{28}{3} + \frac{20}{3}\right) \right| + \left| \frac{16}{3} + \frac{28}{3} \right| = \frac{8}{3} + \frac{44}{3} = \frac{52}{3}$

$$f(x) = 3 \cdot \boxed{\cos}(4 - 7x)$$

$$G(x) = \sin(4 - 7x)$$

$$(G(x))' = g(x) = \sin(4 - 7x) \cdot (-7)$$

$$(-7) \cdot ? = 3$$

$$? = -\frac{3}{7}$$

$$F(x) = -\frac{3}{7} \cdot \sin(4 - 7x)$$

$$\downarrow$$

$$f(x) = -\frac{3}{7} \cdot \cos(4 - 7x) \cdot (-7)$$

$$f(x) = 3 \cdot \cos(4 - 7x)$$