# $f(x) = 2\sin x + \sin 2x$

① $DB = \{x, x \in \mathbb{R}\}$; $P_y(0|0)$

Symm.: Punktsymmetrie:

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

$$2\sin x + \sin(2x) = -(2\sin(-x) + \sin(-2x))$$

$$= -(-2\sin x - \sin(2x))$$

$$= 2\sin x + \sin(2x) \quad \text{wahr}$$

② Nst: $0 = 2\sin x + \sin(2x)$

$0 = 2\sin x + 2\sin x \cos x$

$0 = 2\sin x (1 + \cos x)$

$x_{0_1} = \pi k$ $\qquad 0 = 1 + \cos x$

$\cos x = -1$

$x_{0_2} = \pi + 2\pi k$

$\Rightarrow x_0 = \pi k$

③ Unstetigkeiten keine

④ lok. Extrema: $f'(x) = 2\cos x + 2\cos(2x)$

n.B: $0 = \cos x + \cos(2x)$

$0 = \cos x + 2\cos^2 x - 1 \quad | :2$

$0 = \cos^2 x + \frac{1}{2}\cos x - \frac{1}{2}$

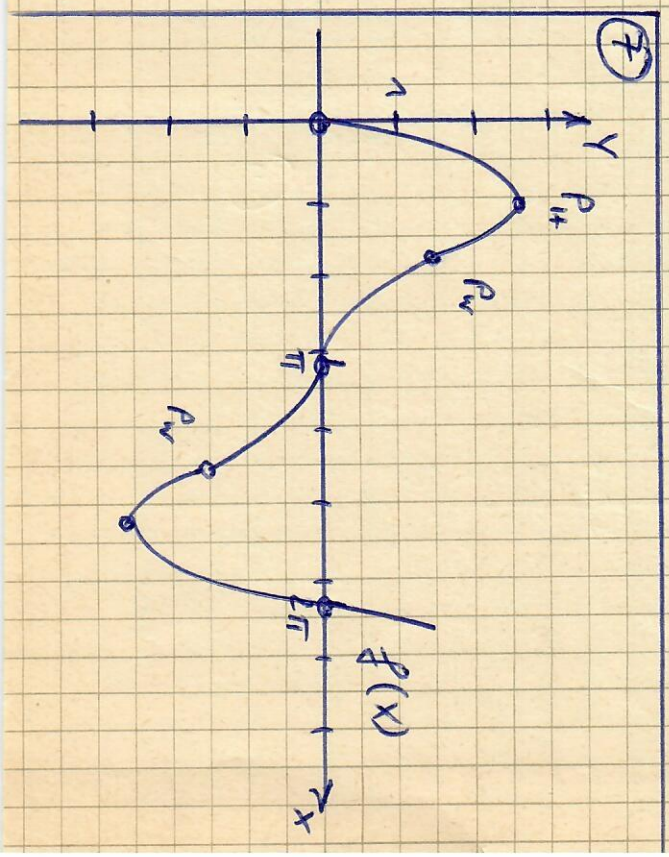
$0 = z^2 + \frac{1}{2}z - \frac{1}{2}$

$0 = (z - \frac{1}{2})(z + 1)$

$\cos x = \frac{1}{2}$ $\qquad \cos x = -1$

$x_{E_1} = \frac{\pi}{3} + 2k\pi$ $\qquad x_{E_3} = \pi + 2k\pi$

$x_{E_2} = \frac{5}{3}\pi + 2k\pi$



$f''(x) = -2\sin x - 4\sin(2x)$

h.B: $f''\left(\frac{\pi}{3}\right) = -2 \cdot \frac{1}{2}\sqrt{3} - 4 \cdot \frac{1}{2}\sqrt{3}$

$= -3\sqrt{3} < 0 \nearrow$ Max; $P_H\left(\frac{\pi}{3} \approx 1 \,\middle|\, 2{,}6\right)$

$f''\left(\frac{5}{3}\pi\right) = -2 \cdot \left(-\frac{1}{2}\sqrt{3}\right) - 4 \cdot \left(-\frac{1}{2}\sqrt{3}\right)$

$= 3\sqrt{3} > 0 \nearrow$ Min; $P_T\left(\frac{5}{3}\pi \,\middle|\, -2{,}6\right)$ $\approx 5{,}2$

$f''(\pi) = -2 \cdot 0 - 4 \cdot 0$

$= 0 \nearrow$ kein lok. Extrema

$\nearrow$ waager. Wendetang.

(5) WP: $f''(x) = -2\sin x - 4\sin(2x)$

nB: $0 = -\sin x - 2\sin(2x)$

$0 = -\sin x - 2(2\sin x \cos x)$

$0 = -\sin x - 4\sin x \cos x$

$0 = -\sin x (1 + 4\cos x)$

$x_{W_1} = \pi k$ $\qquad \cos x = -\frac{1}{4}$

$x_{W_2} \approx 1{,}82$

$x_{W_3} \approx 4{,}46$

$f'''(x) = -2\cos x - 8\cos(2x)$

h.B: $f'''(\pi k) \rightarrow f'''(0) = -2 - 8 = -10 < 0$ LiRe

$f'''(\pi) = 2 - 8 = -6 < 0$ LiRe

$f'''(2\pi) = -2 - 8 = -10 < 0$ LiRe

$f'''(1{,}82) = 0{,}5 + 7 = 7{,}5 > 0$ ReLi

$f'''(4{,}46) = 0{,}5 + 7 = 7{,}5 > 0$ ReLi

$\nearrow I[0\,|\,2\pi]$:

$P_{W_1}(\pi k \,|\, 0)$; $P_{W_2}(1{,}82 \,|\, 1{,}45)$; $P_{W_3}(4{,}46 \,|\, -1{,}45)$

(6) $x \to \pm\infty$ entfällt