

S 154 Nr 10

a) $f(x) = g \cdot \sin(2x)$, $J = [0, \tilde{\pi}]$

$$f(x) = 0 \Rightarrow \sin(2x) = 0 \Rightarrow 2x = 0 \vee 2x = \tilde{\pi} \vee 2x = 2\tilde{\pi}$$
$$x_1 = 0 \vee x_2 = \frac{\tilde{\pi}}{2} \vee x_3 = \tilde{\pi}$$

Nullstellen = $\{0; \frac{\tilde{\pi}}{2}, \tilde{\pi}\}$

Extrema notw Bed. $f'(x) = g \cos(2x) \cdot 2 = 18 \cdot \cos(2x) = 0$
 $\Rightarrow \cos(2x) = 0 \Rightarrow 2x = \frac{\tilde{\pi}}{2} \vee 2x = \frac{3\tilde{\pi}}{2}$

$$x_4 = \frac{\tilde{\pi}}{4} \vee x_5 = \frac{3\tilde{\pi}}{4}$$

hinr. Bed $f''(x) = 18 \cdot (-\sin(2x)) \cdot 2 = -36 \cdot \sin(2x) \neq 0$

$$f''(x_4) = -36 \cdot \sin\left(\frac{\tilde{\pi}}{4}\right) = -36 \cdot \frac{\sqrt{2}}{2} < 0 \Rightarrow \text{Maximum}$$

an der Stelle $x_4 = \frac{\tilde{\pi}}{4}$

$$f''(x_5) = -36 \cdot \sin\left(\frac{3\tilde{\pi}}{4}\right) = -36 \cdot \frac{\sqrt{2}}{2} < 0 \Rightarrow \text{Maximum}$$

an der Stelle $x_5 = \frac{3\tilde{\pi}}{4}$

\Rightarrow Extremstellen = $\left\{\frac{\tilde{\pi}}{4}; \frac{3\tilde{\pi}}{4}\right\}$

b) $f(x) = 2 \sin[(x - \tilde{\pi})]$, $J = [-\tilde{\pi}; \tilde{\pi}]$

Nullstellen $f(x) = 0 \Rightarrow \sin[(x - \tilde{\pi})] = 0 \Rightarrow x - \tilde{\pi} = 0 \Rightarrow x_1 = +\tilde{\pi}$
 $\vee x - \tilde{\pi} = \tilde{\pi} \Rightarrow x_3 = 2\tilde{\pi} \notin J$
 $\vee x - \tilde{\pi} = -\tilde{\pi} \Rightarrow x_2 = 0$
 $\vee x - \tilde{\pi} = -2\tilde{\pi} \Rightarrow x_3 = -\tilde{\pi}$

Nullstellen = $\{-\tilde{\pi}; 0; +\tilde{\pi}\}$

Extrema, notw Bed $f'(x) = 2 \cos[(x - \tilde{\pi})] = 0$

$$\Rightarrow x - \tilde{\pi} = \frac{\tilde{\pi}}{2} \Rightarrow x_4 = -\frac{\tilde{\pi}}{2} \vee x - \tilde{\pi} = \frac{3\tilde{\pi}}{2} \Rightarrow x_5 = +\frac{1\tilde{\pi}}{2}$$

hinr. Bed: $f''(x) = -2 \cdot \sin[(x - \tilde{\pi})]$

$$f''\left(-\frac{\tilde{\pi}}{2}\right) = -2 \sin\left[-\frac{\tilde{\pi}}{2} - \tilde{\pi}\right] = -2 \cdot 1 < 0 \text{ Maximum}$$

$$f''\left(+\frac{\tilde{\pi}}{2}\right) = -2 \cdot \sin\left[\frac{\tilde{\pi}}{2} - \tilde{\pi}\right] = -2 \cdot (-1) > 0 \text{ Minimum}$$

Extremstellen = $\left\{-\frac{\tilde{\pi}}{2}, \frac{\tilde{\pi}}{2}\right\}$