

3. Hausübung

24c) $y = \ln\left(\cos \frac{x}{2}\right)$

$$y' = \frac{-\sin \frac{x}{2}}{\cos \frac{x}{2}} \cdot \frac{1}{2} = -\frac{\sin \frac{x}{2}}{2 \cos \frac{x}{2}} = \underline{\underline{-\frac{1}{2} \tan \frac{x}{2}}}$$

d) $y = \ln\left(\sin \frac{x}{2}\right)$

$$y' = \frac{\cos \frac{x}{2}}{\sin \frac{x}{2}} \cdot \frac{1}{2} = \frac{\cos \frac{x}{2}}{2 \sin \frac{x}{2}} = \underline{\underline{\frac{1}{2} \cot \frac{x}{2}}}$$

30e) $y = \frac{1 + \ln x}{x}$

$$y' = \frac{\frac{1}{x} \cdot x - (1 + \ln x)}{x^2} = \underline{\underline{-\frac{\ln x}{x^2}}}$$

$$y'' = \frac{-\frac{1}{x^2} \cdot x^2 + \ln x \cdot 2x}{x^4} = \frac{-x + 2x \ln x}{x^4} = \underline{\underline{\frac{-1 + 2 \ln x}{x^3}}}$$

$$y''' = \frac{\frac{2}{x} \cdot x^3 - (-1 + 2 \ln x) \cdot 3x^2}{x^6} = \frac{2x^2 + 3x^2 - 6x^2 \ln x}{x^6} =$$

$$= \underline{\underline{\frac{5 - 6 \ln x}{x^4}}}$$

(Entfällt bei Scha + Matura)

1) D

$$D = \mathbb{R}^+$$

2) N: $\ln x = -1 \quad | e^x$

$$N = (0,37 | 0)$$

$$x = \frac{1}{e} \approx \underline{\underline{0,37}}$$

$$H = (1 | 1)$$

3a) E: $\ln x = 0 \Rightarrow \underline{x = 1} \quad ; \quad \underline{y = 1}$

$$W = (1,65 | 0,31)$$

3b) $f''(1) = -1 \Rightarrow \text{Max.}$

4a) W: $2 \ln x = 1$

$$\ln x = 0,5$$

$$\underline{x = \sqrt{e} \approx 1,65} \quad ; \quad \underline{y \approx 0,31}$$

4b) $f'''(1,65) \approx 0,27 \quad \checkmark$

(Entfällt, s.o.)

5) Mon.: $]0; 1[\nearrow$

$]1; \infty[\searrow$

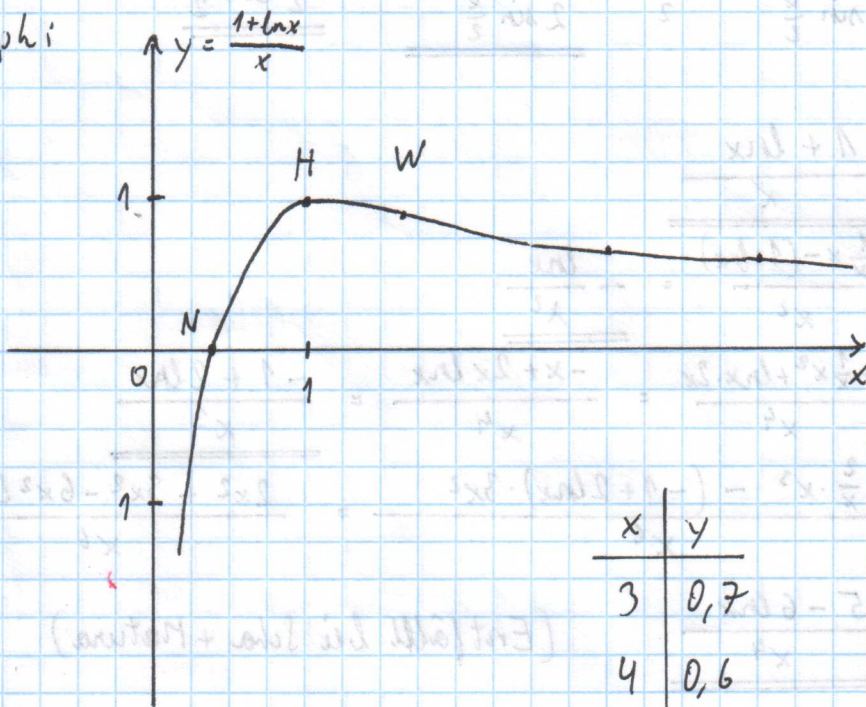
6) Krümm: $]0; 1,65[\ominus$

$]1,65; \infty[\oplus$

7) Randpunkte: $\lim_{x \rightarrow \infty} f(x) = 0$

$\lim_{x \rightarrow 0} f(x) = -\infty$

8) Graph:



9+10) Keine Symmetrie

oder Periodizität