

1. $f(x) = \frac{3x}{x^2-1}$

a) $f'(x) = 3 \cdot \frac{1(x^2-1) - x \cdot 2x}{(x^2-1)^2} = -3 \frac{x^2+1}{(x^2-1)^2}$

$f''(x) = -3 \frac{2x(x^2-1)^2 - (x^2+1)2(x^2-1)2x}{(x^2-1)^4} = 6 \frac{x(x^2+3)}{(x^2-1)^3} \checkmark$

b) VST: $x=0$, ∞ -faden, $\forall x \in \mathbb{R}$

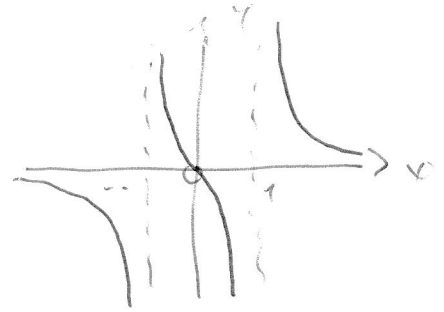
∞ -faden: $x^2+1=0$ (f)

W? : $x=0$, ∞ -faden $\forall x \in \mathbb{R}$, WP(0|0)

Smk. A: $x = \pm 1 \forall x \in \mathbb{R}$ II) = $\mathbb{R} \setminus \{ \pm 1 \}$

W. 2. A: $y=0$ ($z \in \mathbb{N}$)

P.S. $f(-x) = -f(x)$



c) $F(x) = \frac{3}{2} \ln(x^2-1)$

$F'(x) = \frac{3}{2} \frac{1}{x^2-1} \cdot 2x = \frac{3x}{x^2-1} = f(x) \checkmark$

d) $\int_a^a f(x) dx = 5$

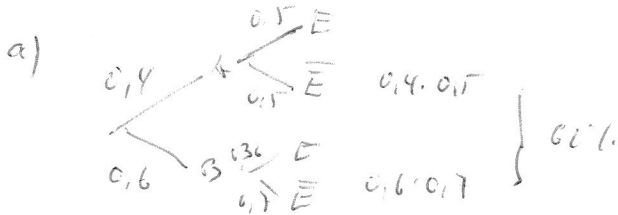
$\frac{3}{2} [\ln(x^2-1)]_a^a = 5$

$\ln(a^2-1) - \ln 3 = \frac{10}{3}$
 $a^2-1 = e^{2/3 + \ln 3} = 3e^{2/3}$

$a = (\pm) \sqrt{3e^{2/3} + 1} \quad a > 2$

2. A: 40% B: 60%

$E_A: 50%$ $E_B: 30%$



b) $p=0,1 \quad \left(P(1u,3) = \binom{3}{1} p^1 (1-p)^2 = 3 \cdot 0,1 \cdot 0,9^2 = 24,3\% \right)$

$f(1u,3) = \left(\frac{1}{10} + \frac{9}{10} \cdot \frac{1}{9} + \frac{9}{10} \cdot \frac{8}{9} \cdot \frac{1}{9} \right)^{0,3} = 0,3^2 = \underline{\underline{9\%}}$

c) $P(\cup A) = \frac{0,4 \cdot 0,5}{0,4 \cdot 0,5 + 0,6 \cdot 0,3} = \frac{20\%}{60\%} = 33,3\%$

d) $P(N \mid p=60\%) > 99,99\%$

$1 - P(\text{Kein } n) > 0,9999$

$1 - (0,38)^N > 0,9999$

$N > \log_{0,38} \frac{0,0001}{0,6001} = 9,77$

Ab 10 Versuche

3. $A(1|2|2) \quad B(3|4|3) \quad C(2|6|5)$

a) $D(0|4|4)$

$\vec{AB} = \begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix} \quad \vec{DC} = \begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix}$

$\vec{AB} = \vec{DC} \Rightarrow$ Parallelogramm

b) $\vec{AC} = \begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix}$
 $\vec{DB} = \begin{pmatrix} 3 \\ 0 \\ 1 \end{pmatrix}$

$\cos \varphi = \frac{\vec{AC} \cdot \vec{DB}}{|\vec{AC}| \cdot |\vec{DB}|} = \frac{0}{\dots} = 0$
 $\varphi = 90^\circ$

c) $M = (\vec{r}_A + \vec{r}_D) / 2 = \begin{pmatrix} 3/2 \\ 4 \\ 7/2 \end{pmatrix} \quad M(1,5|4|3,5)$

d) $E: \vec{x} = \vec{A} + s\vec{AB} + t\vec{AC} = \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix} + s\begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix} + t\begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix}$

e) $F(3,4,z) \quad \vec{AB} \times \vec{AC} = \begin{pmatrix} 2 \\ -5 \\ 6 \end{pmatrix} \sim \vec{AF} = \begin{pmatrix} 2 \\ 4-z \\ z-2 \end{pmatrix} \quad \vec{n} = h \cdot \vec{AF}$
 $h = 1$

$-5 = y - 2$
 $y = -3$
 $6 = z - 2$
 $z = 8$

f) $A = \frac{1}{2} e f = \frac{1}{2} |\vec{AC} \cdot \vec{DB}| = \frac{1}{2} \sqrt{16} \sqrt{10} = \sqrt{40}$

4 a) $f(x) = ax^3 + bx^2 + cx + 3$; $f(3) = 0$; $f'(3) = 3$; $f''(3) = 0$
 $27a + 9b + 3c + 3 = 0 \quad | \quad 27a + 6b + c = 3 \quad | \quad 18a + 12b = 0$

$f(x) = -\frac{4}{9}x^3 + 4x^2 - 9x + 3$

b) $x^3 - 4x^2 + 4x - 3 = 0 \quad P(4,4|2,1) \quad P \sim h: 0=0 \checkmark$
 $M(2|4) \quad \vec{MP} = \begin{pmatrix} 2,4 \\ -1,8 \end{pmatrix} \quad t: \vec{x} = \begin{pmatrix} 4,4 \\ 2,1 \end{pmatrix} + t \begin{pmatrix} 1,8 \\ 2,4 \end{pmatrix}$

c) $y = e^{2x+1} \quad y = 2x \quad \text{min. Abstand} \rightarrow ||: \quad 2e^{2x+1} = 2$
 $e^{2x+1} = 1$
 $x = -1$

d) $y = -\frac{1}{2}x^4 + 8 \quad \text{NSF: } x = \pm 4$
 $A = \frac{8+2x}{2}, f(x) = (4+x) \cdot (-\frac{1}{2}x^4 + 8)$
 $f'(x) = -\frac{3}{2}x^4 - 4x + 8 = 0$
 $x = -4 \quad | \quad x = \frac{4}{3} \quad A'(\frac{4}{3}) > 0 \Rightarrow \text{Min} \quad A(0) = 0 \quad A(4) = 0 \quad P(\frac{4}{3} | 64/9)$

e) $\int_0^{\frac{\pi}{4}} (\sin(2x+9)) dx = [-\frac{1}{2} \cos(2x+9)]_0^{\frac{\pi}{4}} = -\frac{1}{2}$