B1

$$\lim_{x\to 7} \frac{x^2+1}{x^2-1}\left(e^{x^2+1}-e^{50}\right)\operatorname{tg}\frac{\pi x}{14} =$$

$$= \underbrace{\lim_{x\to 7} \frac{x^2+1}{x^2-1}\cdot e^{50}}_{= e^{50}\cdot\frac{50}{48}} \cdot \underbrace{\lim_{x\to 7} \frac{e^{x^2+1-50}-1}{x^2-49}}_{=1 \text{ CFT}} \cdot \lim_{x\to 7} (x^2-49)\operatorname{tg}\frac{\pi x}{14}$$

$$= e^{50}\cdot\frac{25}{24}\cdot \lim \frac{x^2-49}{\cos\frac{\pi x}{14}} \cdot \underbrace{\lim_{x\to 7} \sin\frac{\pi x}{14}}_{=1} =$$

$$\overset{L'H}{\underset{\text{"}\frac{0}{0}\text{"}}{=}} e^{50}\,\frac{25}{24} \lim_{x\to 7} \frac{2x}{\frac{\pi}{14}\cdot\left(-\sin\frac{\pi x}{14}\right)} = e^{50}\,\frac{25}{24}\cdot\frac{14}{\frac{\pi}{14}\cdot(-1)} =$$

$$= -e^{50}\,\frac{25\cdot 49}{6\pi}$$

fraction 1pt
exponential 4pts
tg 6pts
result 1pt
CFT del 3pts

$f(x) = e^{x^3+1}$ (B2)

$D_f = \mathbb{R}$ $\lim_{x\to+\infty} f(x) = +\infty$, $\lim_{x\to-\infty} f(x) = 0$ +1

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

$f'' = e^{x^3+1} \cdot 9x^4 + e^{x^3+1} \cdot (6x) = e^{x^3+1} \cdot 3x(3x^3+2)$ +2

increasing on $(-\infty, 0), (0, +\infty)$ +4

NO LOCAL EXTREMA

convexity $f''>0 \iff x>0$ & $3x^3+2>0$

OR

$x<0$ & $3x^3+2<0$

convex on $(0,+\infty), (-\infty, -\sqrt[3]{\frac{2}{3}})$

concave on $(-\sqrt[3]{\frac{2}{3}}, 0)$ +6

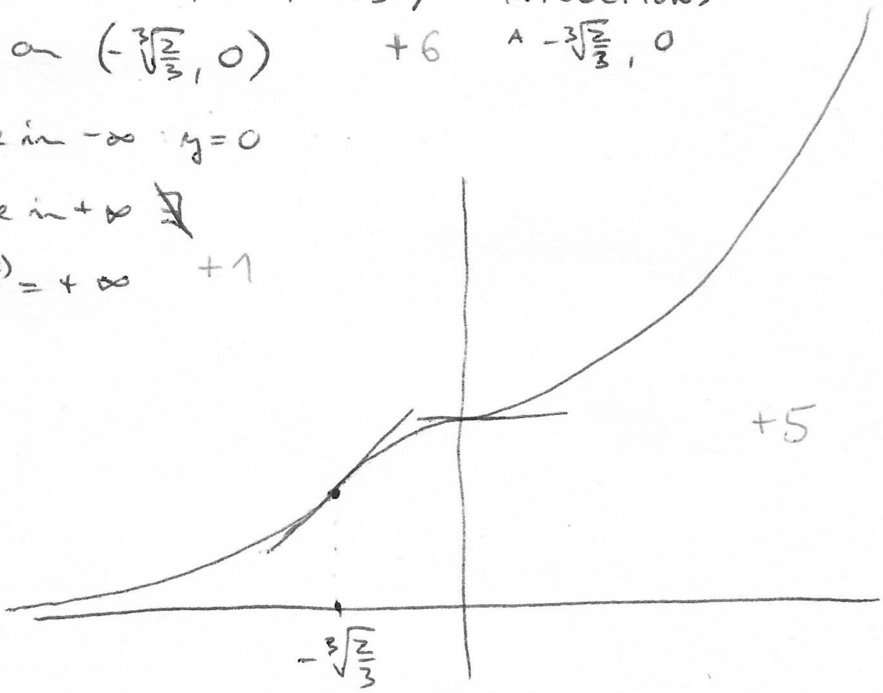
INFLECTIONS

A $-\sqrt[3]{\frac{2}{3}}$, 0

asymptote in $-\infty$: $y=0$

asymptote in $+\infty$ $\nexists$

$\lim \frac{f(x)}{x} = +\infty$ +1



+5

B3

$$g(x)=\begin{cases} 2\,tg\,\dfrac{|x-2|}{x^2} + \dfrac{x}{4} & x\neq 2 \\ 1 & x=2 \end{cases}$$

$$g(x)=\begin{cases} 2\,tg\,\dfrac{x-2}{x^2} + \dfrac{x}{4} & x>2 \\ -2\,tg\,\dfrac{x-2}{x^2} + \dfrac{x}{4} & x<2 \\ 1 & x=2 \end{cases}$$ +2

$g(2)=1$ $\quad \lim_{x\to 2^+} g = \lim_{x\to 2^-} g = 0 + \frac{2}{4} = \frac{1}{2}$ NOT CONT +2

$$g'(x)=\begin{cases} 2\,\dfrac{1}{\cos^2\frac{x-2}{x^2}} \cdot \dfrac{x^2-2x(x-2)}{x^4} + \dfrac{1}{4} & x>2 \\ -2\,\dfrac{1}{\cos^2\frac{x-2}{x^2}} \cdot \dfrac{x^2-2x(x-2)}{x^4} + \dfrac{1}{4} & x<2 \end{cases}$$ +2

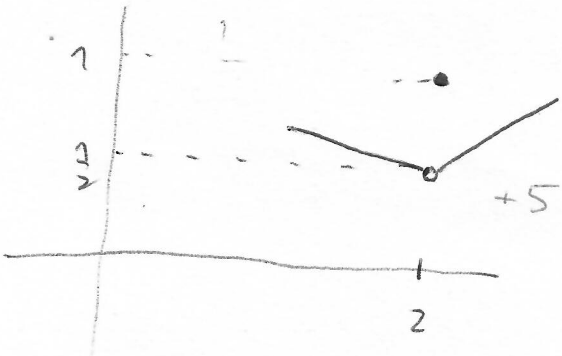
$\lim_{x\to 2^+} g' = \frac{2}{\cos 0} \cdot \frac{4-4\cdot 0}{16} + \frac{1}{4} = \frac{3}{4}$

$\lim_{x\to 2^-} g' = -\frac{1}{2} + \frac{1}{4} = -\frac{1}{4}$ +2

$g'_-(2) = +\infty$

$g'_+(2) = -\infty$ +2

$g'(2)$ $\nexists$



+5