1) $f(x) = \operatorname{arctg}\left(\frac{x}{x^2+1}\right)$

$D: \mathbb{R}$, $f(-x) = \operatorname{arctg}\left(\frac{-x}{(-x)^2+1}\right) = \operatorname{arctg}\left(\frac{-x}{x^2+1}\right) \overset{\text{arcotangente è dispari}}{=} -f(x)$

f è DISPARI

$f(x) \geq 0 \iff \frac{x}{x^2+1} \geq 0 \iff x \geq 0$

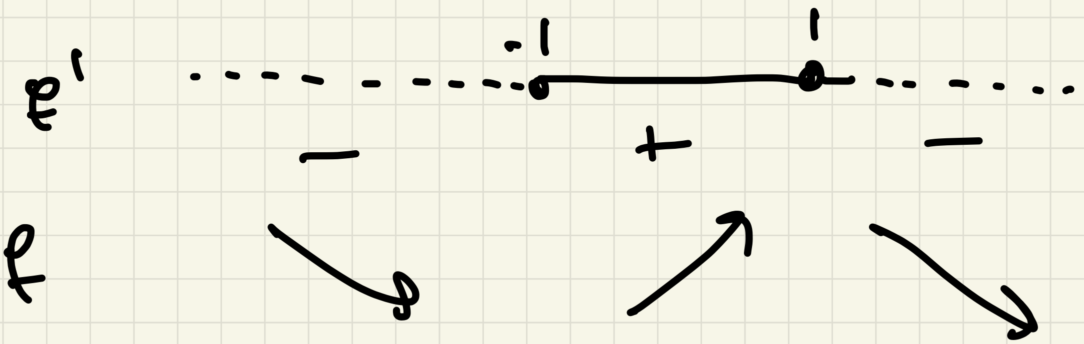
$$\lim_{x \to +\infty} \operatorname{arctg}\left(\frac{x}{x^2+1}\right) = \operatorname{arctg} 0 = 0 = \lim_{x \to -\infty} f(x)$$

$y=0$ è AS. ORIZZ a $\pm\infty$.

$$f'(x) = \overbrace{\frac{1}{1+\left(\frac{x}{x^2+1}\right)^2}}^{\text{derivata arcotangente}} \cdot \overbrace{\frac{x^2+1-x\cdot 2x}{(x^2+1)^2}}^{\text{derivata argom.}} = \frac{1}{1+\left(\frac{x}{x^2+1}\right)^2} \cdot \frac{1-x^2}{(1+x^2)^2}.$$

f è derivabile $\forall\, x \in \mathbb{R}$

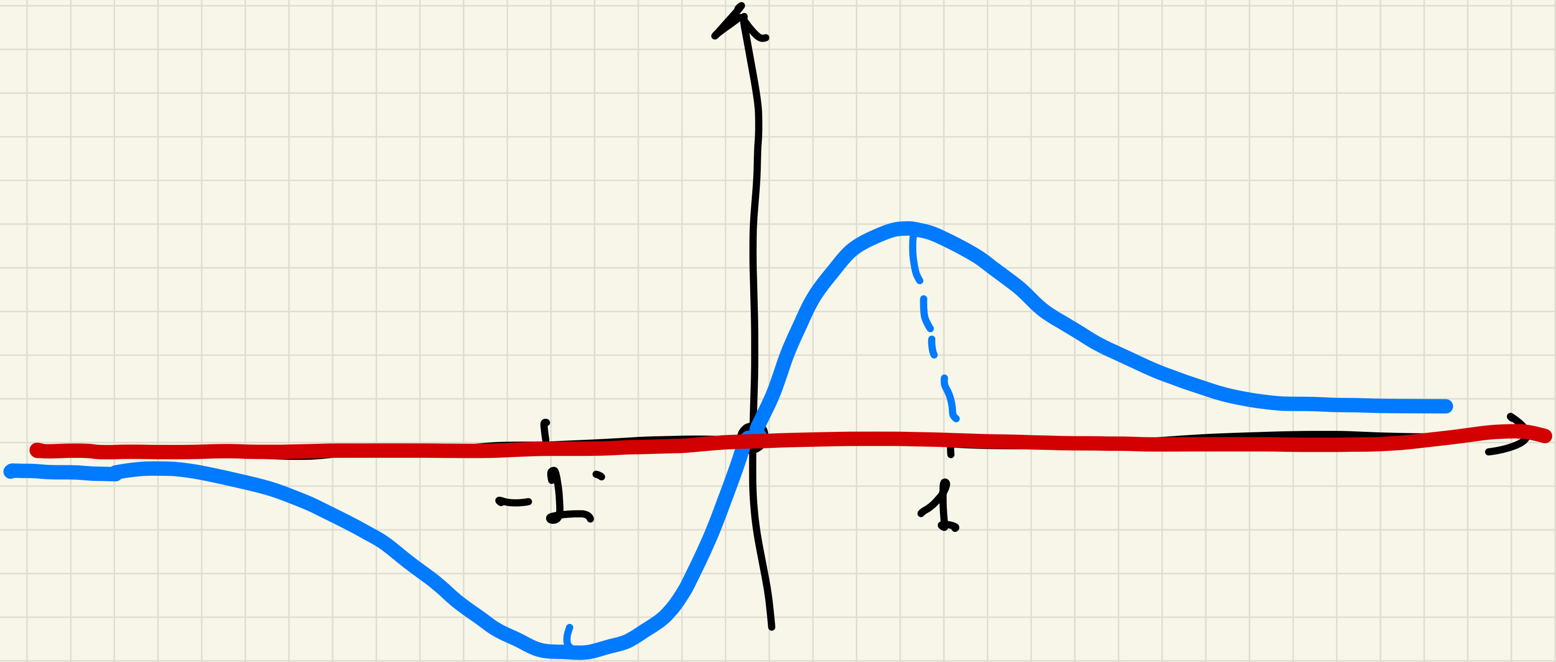
$f'(x) \geq 0 \iff 1 - x^2 \geq 0 \iff x^2 - 1 \leq 0 \iff -1 \leq x \leq 1$



$x = -1$ pto di min locale

$x = 1$ pto di max locale

dato che $f(x) \to 0$ per $x \to \pm\infty$ $x = 1$ è anche pto di max assoluto e $\max f = f(1) = \operatorname{arctg} 1/2$ e $x = -1$ è pto di min. assoluto $\min f = f(-1) = -\operatorname{arctg} \frac{1}{2}$



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

$D = \{x \neq 0\} = (-\infty, 0) \cup (0, +\infty)$

$f(-x) \neq f(x), -f(x)$ f non è pari né dispari

$f(x) \geq 0 \qquad x\, \underbrace{e^{-1/x}}_{>0 \text{ sempre}} \geq 0 \iff x \geq 0$

$$\lim_{x\to 0^+} \underset{\overset{\downarrow}{0}}{x}\; \underbrace{e^{-\overset{+\infty}{1/x}}}_{\overset{\downarrow}{0}} = 0$$

$$\lim_{x\to 0^-} x \cdot e^{-\frac{1}{x}} = \begin{pmatrix} y = -\frac{1}{x} & x \to 0^- \\ x = -\frac{1}{y} & y \to +\infty \end{pmatrix} = \lim_{y\to+\infty} -\frac{1}{y}\, \overset{\overset{+\infty}{\uparrow}}{e^{y}} \overset{\text{per confronto infiniti}}{=} -\infty$$

$x=0$ discont di 2^a specie

$$\lim_{x\to+\infty} x\; \underbrace{e^{-\overset{\to 0}{1/x}}}_{\overset{\downarrow}{1}} = +\infty$$

$$\lim_{x\to-\infty} x\; e^{-1/x} \xrightarrow{} 1 \quad = -\infty$$

non ci sono as. orizzontali.

cerco as. obliqui (a $+\infty$ e a $-\infty$

$$\lim_{x\to+\infty} \frac{\cancel{x} e^{-\frac{1}{x}}}{\cancel{x}} = \lim_{x\to+\infty} e^{-\frac{1}{x}} = 1 = m = \lim_{x\to-\infty} \frac{x e^{-1/x}}{x}$$

$$\lim_{x\to+\infty} x e^{-\frac{1}{x}} - x = \quad y = -\frac{1}{x} \quad \begin{matrix} x\to+\infty \\ y\to 0^- \end{matrix} \quad x = -\frac{1}{y} \quad = \lim_{y\to 0^-} -\frac{1}{y} e^{y} + \frac{1}{y} =$$

$$= \lim_{y\to 0^-} \frac{-e^{y}+1}{y} = \lim_{y\to 0^-} -\underbrace{\left(\frac{e^{y}-1}{y}\right)} = -1 = q$$

limite notevole

stessa cosa a $-\infty$.
($y\to 0^+$)

$$\boxed{y = x - 1}$$

ASINTOTO OBLIQUO
a $+\infty$ e a $-\infty$

$$f'(x) = 1\cdot e^{-1/x} + \boxed{x}\cdot\left(e^{-1/x}\right)\cdot\left(+\frac{1}{x^{\boxed{2}}}\right) = e^{-1/x}\left(1+\frac{1}{x}\right) =$$

$$= e^{-\frac{1}{x}}\left(\frac{x+1}{x}\right)$$

f è derivabile $\forall x \neq 0$

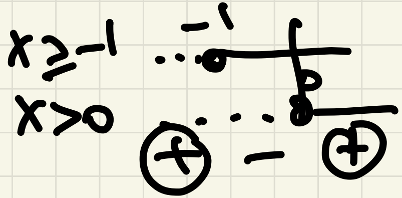
visto che $\lim_{x\to 0^+} f(x) = 0$ calcolo $\lim_{x\to 0^+} f'(x)$

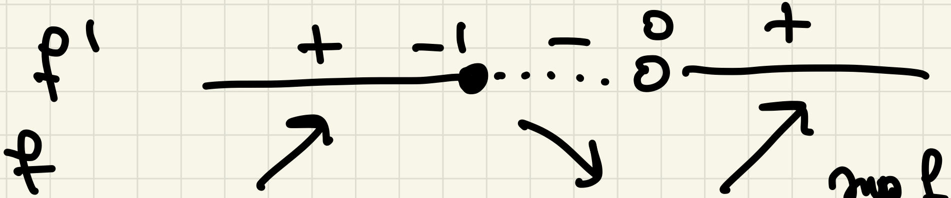
$$\lim_{x\to 0^+} e^{-1/x}\left(1+\frac{1}{x}\right) = \quad y=-\frac{1}{x} \quad y\to-\infty \quad = \lim_{y\to-\infty} e^{y}(1-y) = 0$$

↓ confronto tra infiniti

in $x=0^+$ la tangente è ORIZZONTALE

$$f'(x)\geq 0 \iff \underset{\substack{\vee\\ 0}}{\boxed{e^{-1/x}}}\left(\frac{x+1}{x}\right)\geq 0 \iff \frac{x+1}{x}\geq 0$$





$x=-1$ è pto di max locale

$x=0$ NON E' NEL DOMINIO!

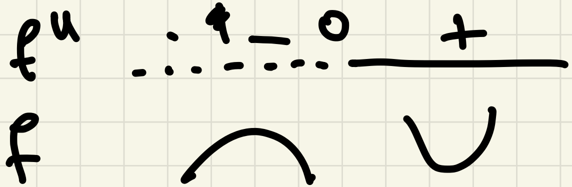
$\sup f = +\infty \quad \inf f = -\infty$

$$f'(x) = e^{-1/x} \, \frac{x+1}{x}$$

$$f''(x) = \overbrace{e^{-1/x} \cdot \left(+\frac{1}{x^2}\right)}^{\text{derivata } e^{-1/x}} \cdot \frac{x+1}{x} + e^{-1/x} \cdot \overset{\text{derivata } \frac{x+1}{x}}{\boxed{\frac{1 \cdot x - (x+1) \cdot 1}{x^2}}} =$$

$$= e^{-\frac{1}{x}} \left[\frac{+(x+1)}{x \cdot (x^2)} + \frac{-1}{x^2} \right] = e^{-1/x} \, \frac{+x+1-x}{x^3} = e^{-1/x} \frac{1}{x^3}$$

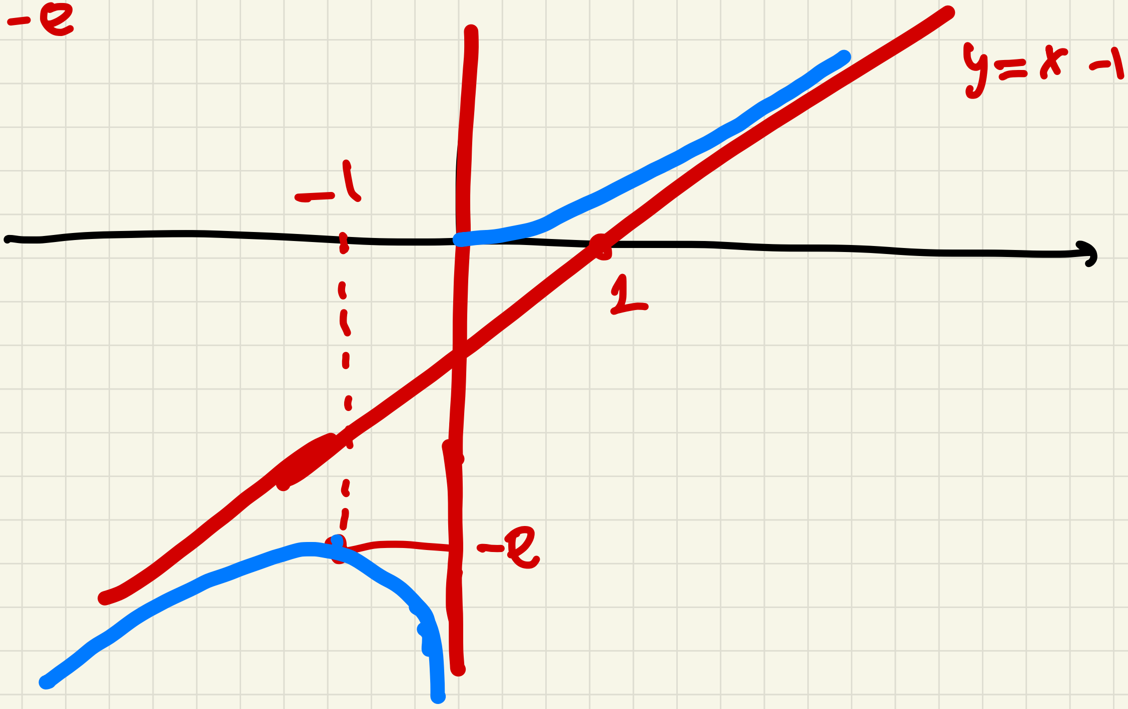
$$f''(x) \geq 0 \iff x > 0$$



f è convessa per $x>0$ e concava per $x<0$

($x=0$ non sta nel dominio!)

$f(-1) = -e$



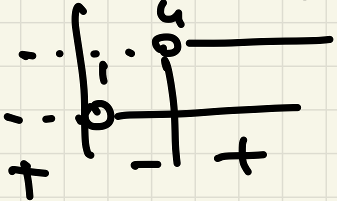
3) $f(x) = \lg\left(\frac{x-4}{x-1}\right)$

no simmetrie

$D: \frac{x-4}{x-1} > 0$

$x - 4 > 0 \qquad x > 4$

$x - 1 > 0 \qquad x > 1$



D: $(-\infty, +1) \cup (4, +\infty)$

$f(x) \geq 0 \qquad \lg\left(\frac{x-4}{x-1}\right) \geq 0 = \lg 1 \iff \frac{x-4}{x-1} \geq 1 \iff$

$\frac{x-4}{x-1} - 1 \geq 0 \qquad \frac{x-4-x+1}{x-1} \geq 0 \iff \frac{-3}{x-1} \geq 0 \iff \frac{3}{x-1} < 0$

$\iff x-1<0 \qquad \boxed{x<1}$

$$\lim_{x\to 4^+} \lg\Bigg(\overset{0^+}{\overbrace{\frac{\overset{\to 0^+}{x-4}}{\underset{\to 3}{x-1}}}}\Bigg) = -\infty$$

x=4 AS. VERTICALE DESTRO

$$\lim_{x\to 1^-} \lg\Bigg(\underbrace{\frac{\overset{\to -3}{x-4}}{\underset{\to 0^-}{x-1}}}_{+\infty}\Bigg) = +\infty$$

x=1 AS. VERTICALE DESTRO

$$\lim_{x\to+\infty} \lg\left(\frac{x-4}{x-1}\right) = \lim_{x\to+\infty} \lg\left(\frac{\cancel{x}\left(1-\frac{4}{x}\right)}{\cancel{x}\left(1-\frac{1}{x}\right)}\right) = \lg 1 = 0$$

$$\lim_{x\to-\infty} \lg\left(\frac{x-4}{x-1}\right) = \lim_{x\to-\infty} \lg\left(\frac{\cancel{x}\left(1-\frac{4}{x}\right)}{\cancel{x}\left(1-\frac{1}{x}\right)}\right) = \lg 1 = 0$$

y=0 AS. ORIZZ a $+\infty$, $-\infty$

$$f'(x) = \underbrace{\frac{1}{\frac{x-4}{x-1}}}_{\text{derivata logaritmo}} \cdot \frac{1\cdot(x-1)-1\cdot(x-4)}{(x-1)^2} = \frac{\cancel{x-1}}{x-4}\cdot\frac{x-1-x+4}{(x-1)^{\cancel{2}}} = \frac{3}{(x-4)(x-1)}$$

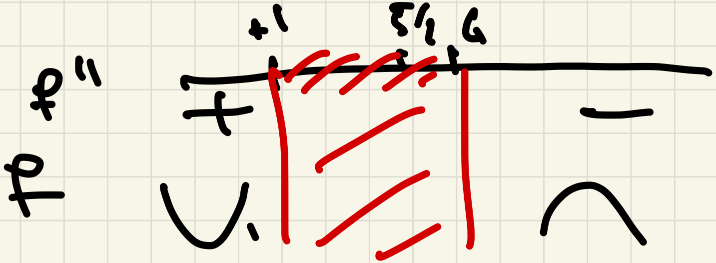
$$= \frac{3}{x^2-5x+4}$$

dunque $f'(x) \geq 0 \iff (x-4)(x-1) > 0 \iff x \in D$!

f crescente nel dominio $\quad \sup f = +\infty \quad \inf f = -\infty$

$$f''(x) = \frac{-3(2x-5)}{\boxed{(x^2-5x+4)^2} > 0} \quad (x \neq 1,4)$$

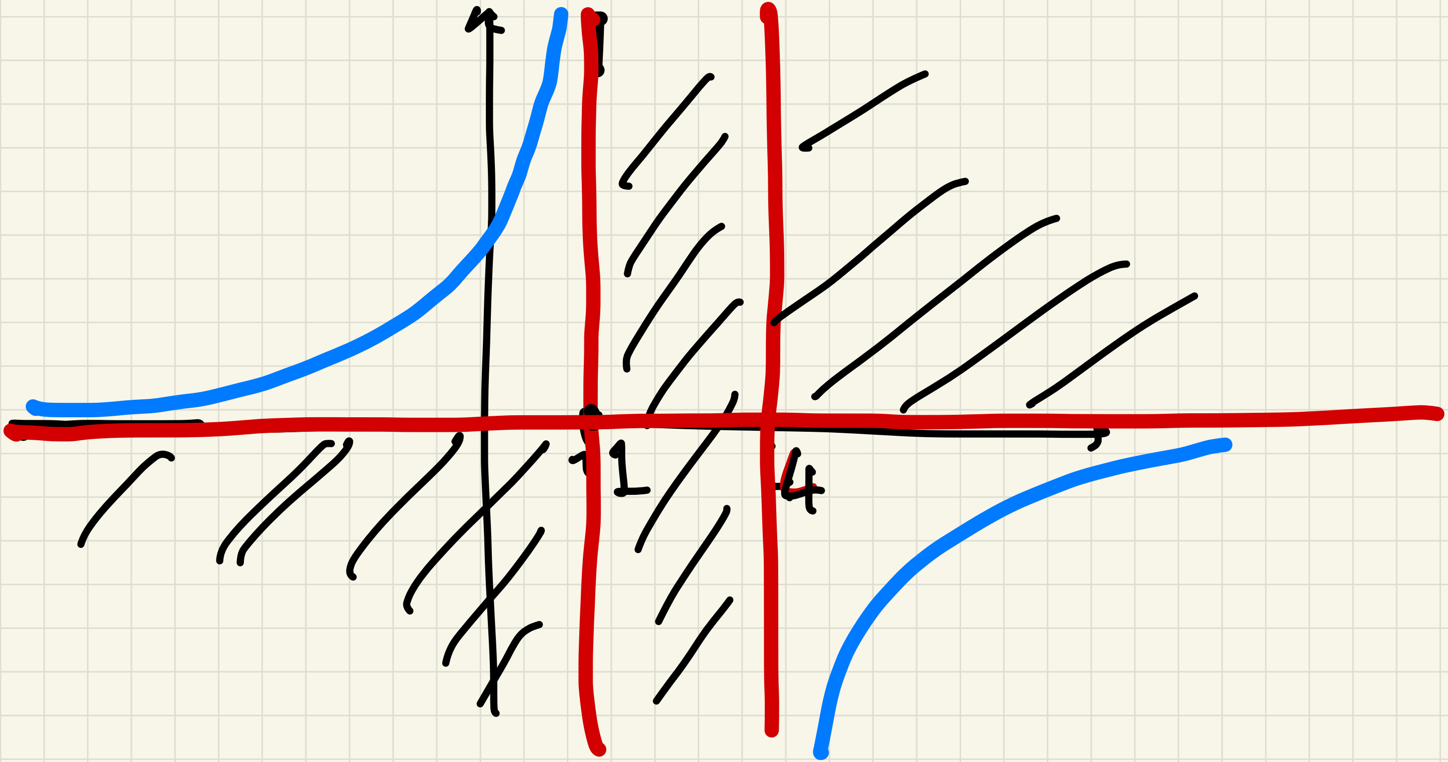
$$f''(x) \geq 0 \iff -3(2x-5) \geq 0 \iff 2x-5 \leq 0 \iff x \leq \overset{2,5}{\boxed{\frac{5}{2}}}$$



$x = 5/2 \notin D$

f è convessa per $x < 1$

f è concava per $x > 4$



4) $f(x) = \text{arctg}\,(\text{sen}\,x)$

$D = \mathbb{R}$ $\quad f(x+2\pi) = \text{arctg}\,(\text{sen}\,(x+2\pi)) = \text{arctg}\,(\text{sen}\,x)$

f è periodica di periodo 2π → basta studiarla in $[-\pi, \pi]$

$$f(-x) = \operatorname{arctg}(\operatorname{sen}(-x)) \underset{\substack{\uparrow \\ \text{sen è} \\ \text{dispari}}}{=} \operatorname{arctg}(-\operatorname{sen}x) \underset{\substack{\uparrow \\ \text{arctg è} \\ \text{DISPARI}}}{=} -\operatorname{arctg}(\operatorname{sen}x)$$

f è dispari

$$f(x) \geq 0 \iff \operatorname{sen}x \geq 0 \iff 2k\pi \leq x \leq \pi + 2k\pi$$

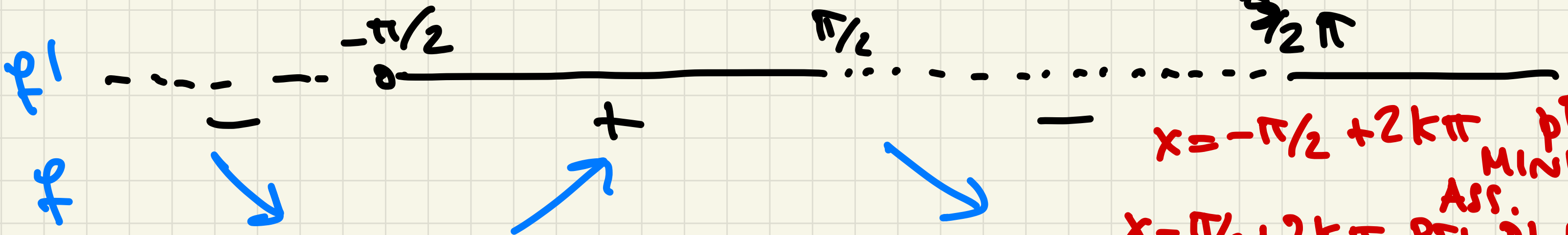
f è periodica ⇒ NON HA LIMITI A ± ∞ !

derivata arcotangente

$$f'(x) = \boxed{\frac{1}{1+(\operatorname{sen}x)^2}} \cdot \underbrace{\cos x}_{\substack{\text{derivata} \\ \text{seno}}} = \frac{1}{1+\operatorname{sen}^2 x} \cdot \cos x$$

f è deriv. in ℝ

$$f'(x) \geq 0 \iff \cos x \geq 0 \iff -\frac{\pi}{2} + 2k\pi \leq x \leq \frac{\pi}{2} + 2k\pi$$

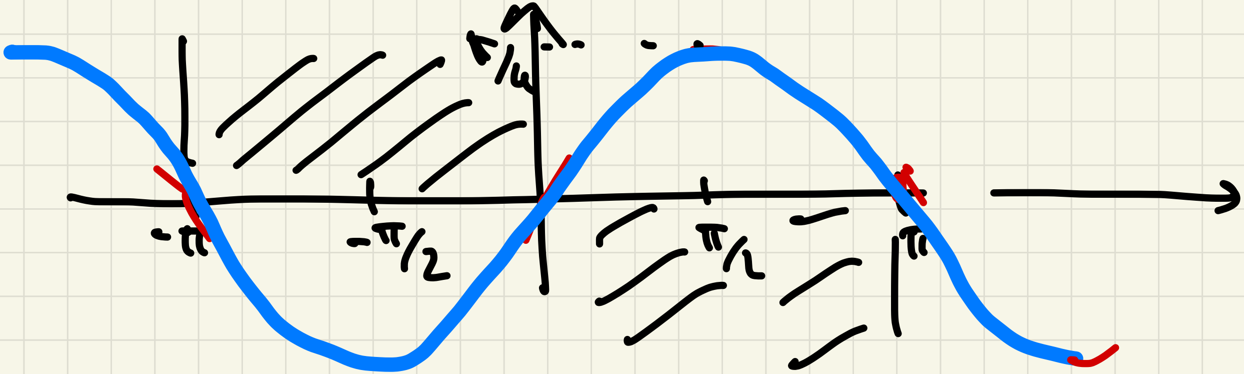


$x = -\pi/2 + 2k\pi$ pti di MINIMO ASS.

$x = \pi/2 + 2k\pi$ PTI DI MAX ASS

$f\left(\frac{\pi}{2}\right) = \operatorname{arctg}\left(\operatorname{sen}\frac{\pi}{2}\right) = \operatorname{arctg} 1 = \pi/4$

$f\left(-\frac{\pi}{2}\right) = \operatorname{arctg}\left(\operatorname{sen} -\frac{\pi}{2}\right) = -\pi/4$



5) $f(x) = \operatorname{arctg}\left(\frac{1}{|x-1|}\right)$

$D: \{x \neq 1\} = (-\infty, 1) \cup (1 + \infty)$ no simmetrie

dato che $\frac{1}{|x-1|} > 0 \quad \forall x \in D \Rightarrow f(x) > 0 \quad \forall x \in D$

$$\lim_{x\to 1} \operatorname{arctg} \frac{1}{|x-1|} = \pi/2 \qquad \frac{1}{0^+} = +\infty$$

x=1 è singolarità eliminabile

estendo per continuità in x=1

ponendo $f(1) = \pi/2$.

$$\lim_{x\to +\infty} \operatorname{arctg} \frac{1}{|x-1|} = 0 = \lim_{x\to -\infty} \operatorname{arctg} \frac{1}{|x-1|} \qquad \frac{1}{\infty} = 0 \qquad \frac{1}{+\infty} = 0$$

$y = 0$

AS. ORIZZ

a $+\infty$, $-\infty$.

derivate $x > 1$ $\quad f(x) = \operatorname{arctg}\left(\frac{1}{x-1}\right)$ $\quad f'(x) = \frac{1}{1+\left(\frac{1}{x-1}\right)^2} \cdot \frac{-1}{(x-1)^2} =$

$$= \frac{1}{\frac{(x-1)^2+1}{\cancel{(x-1)^2}}} \cdot \frac{(-1)}{\cancel{(x-1)^2}} = \frac{-1}{(x-1)^2+1} < 0$$

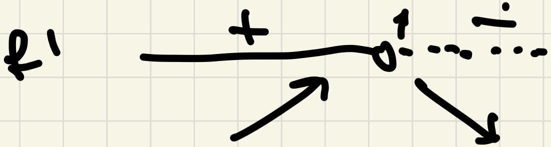
$x < 1$ $\quad f(x) = \operatorname{arctg} \frac{1}{1-x}$

$$f'(x) = \frac{1}{1+\left(\frac{1}{1-x}\right)^2} \cdot \frac{1}{(1-x)^2} = \frac{1}{(1-x)^2+1} > 0$$

f DERIV. in $x \neq 1$

$x=1$ PTO ANGOLOSO

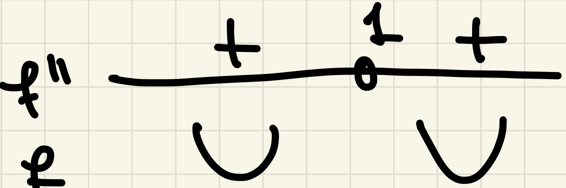
$$\lim_{x\to 1^+} f'(x) = \lim_{x\to 1^+} \frac{-1}{(x-1)^2+1} = -1 \qquad \lim_{x\to 1^-} f'(x) = \lim_{x\to 1^-} \frac{1}{(1-x)^2+1} = 1$$



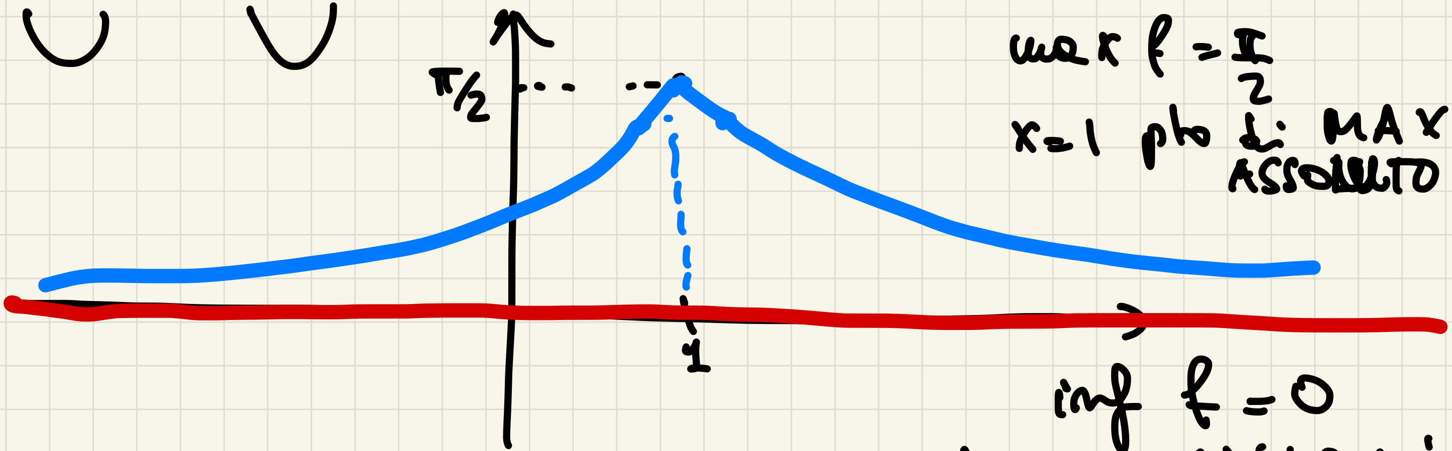
x=1 pto di MAX LOCALE e anche ASSOLUTO $f(1) = \pi/2 = \max f$

$x>1$ $f'(x) = -\frac{1}{(x-1)^2+1} = -\frac{1}{x^2-2x+2} \Rightarrow f''(x) = +\frac{2x-2}{(x^2-2x+2)^2} = \frac{2(x-1)}{(x^2-2x+2)^2}$

$x<1$ $f'(x) = \frac{1}{(1-x)^2+1} = \frac{1}{x^2-2x+2} \Rightarrow f''(x) = \frac{-(2x-2)}{(x^2-2x+2)^2} = \frac{-2(x-1)}{(x^2-2x+2)^2}$



f è sempre convessa



$\max f = \frac{\pi}{2}$

$x=1$ pto di MAX ASSOLUTO

$\inf f = 0$

ma non ci sono minimi

6) $f(x) = \arcsin\sqrt{x} - \lg x$

D: $x>0$ (per il logaritmo) ; $x \geq 0$ (per radice) $\Big]$ $\boxed{x>0}$

$-1 \leq \sqrt{x} \leq 1$ (per arcoseno) $\Rightarrow$ $\sqrt{x} \leq 1 \rightarrow \boxed{x \leq 1}$

D: $\{0<x\leq 1\} = (0, 1]$

$f(1) = \arcsin 1 - \lg 1 =$
$= \pi/2 - 0 = \pi/2.$

NB $\arcsin\sqrt{x} \geq 0$ perché $\sqrt{x} \geq 0$!
$\lg x \leq 0$ se $x \in (0,1] \Rightarrow -\lg x \geq 0$ $\Big]$ $f(x) = \underbrace{\arcsin\sqrt{x}}_{\geq 0} \underbrace{-\lg x}_{\geq 0}$

$f(x) \geq 0 \quad \forall x \in D.$

$$\lim_{x\to 0^+} \underbrace{\arcsin\sqrt{x}}_{\to 0} \underbrace{-\lg x}_{-(-\infty)} = +\infty$$

$x=0$
AS. VERTICALE DESTRO

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

f' esiste $\forall x \in (0,1$

f è derivabile per ogni $0<x<1$

studio derivabilità in $x=1$ (x = 1 STA NEL DOMINIO)

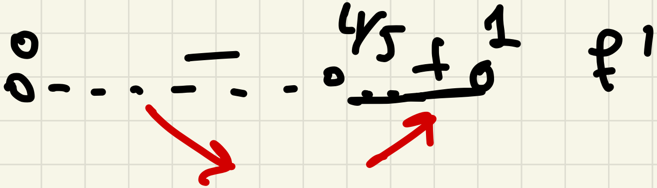
$$\lim_{x\to 1^-} f'(x) = \lim_{x\to 1^-} \frac{\overset{\to 1-2\cdot 0=1}{\boxed{\sqrt{x}-2\sqrt{1-x}}}}{\underbrace{2x}_{2}\underbrace{\sqrt{1-x}}_{0^+}} = +\infty$$

f in $x=1$ ha TANGENTE VERTICALE

$$f'(x)\geq 0 \qquad \frac{\sqrt{x}-2\sqrt{1-x}}{\underbrace{2x\sqrt{1-x}}_{>0}}\geq 0 \iff \sqrt{x}-2\sqrt{1-x}\geq 0$$

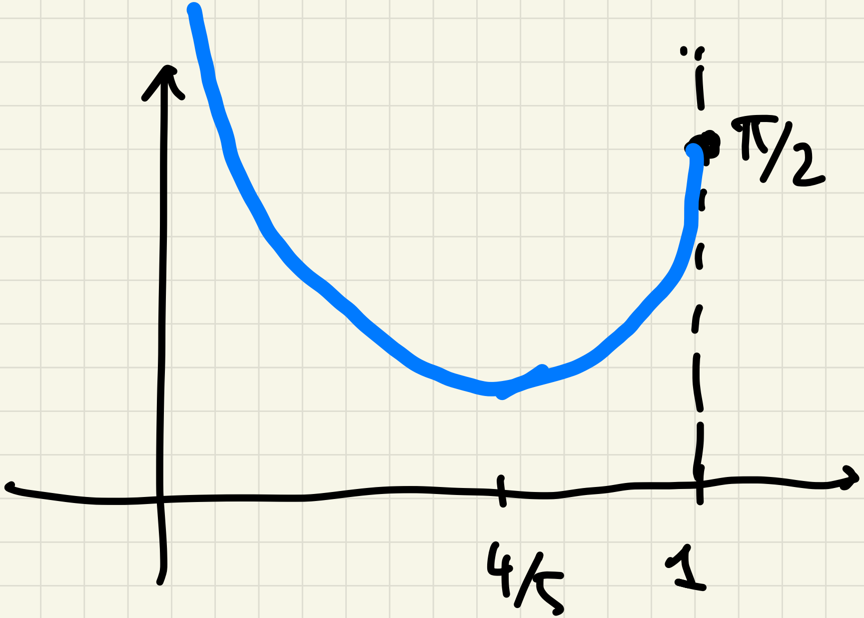
$$\iff (\sqrt{x})^2 \geq (2\sqrt{1-x})^2 \qquad x\geq 4(1-x) \qquad x\geq 4-4x$$

$$5x\geq 4 \qquad x\geq \frac{4}{5}$$



$x = \frac{4}{5}$ pto di minimo locale (e anche assoluto)

$x = 1$ pto di massimo locale



7) $f(x) = \sqrt{\dfrac{x^2-1}{x-2}}$

D: $\dfrac{x^2-1}{x-2} \geq 0$ $\quad x^2-1 \geq 0 \quad x \geq 1 \;\; x \leq -1$

$\qquad\qquad\qquad\quad x-2 > 0 \quad\;\; x > 2$

D: $\{ x > 2, -1 \leq x \leq 1 \} = [-1,1] \cup (2,+\infty)$

no simmetrie , $\boxed{f(x) \geq 0 \quad \forall x \in D \qquad f(1) = f(-1) = 0}$

NB
min f = 0
f(1) = f(-1) =
= min f

$\lim_{x \to 2^+} \sqrt{\dfrac{\overset{\to 3}{x^2-1}}{\underset{\to 0^+}{x-2}}} = +\infty$ $\qquad$ x = 2 AS. VERT. DESTRO

$\lim_{x \to +\infty} \sqrt{\dfrac{x^2-1}{x-2}} = \lim_{x \to +\infty} \sqrt{\dfrac{x^2(1-\frac{1}{x^2})}{x(1-\frac{2}{x})}} = +\infty$ (confronto infiniti)

cerco as. obliquo $\lim_{x \to +\infty} \dfrac{1}{x} \cdot \sqrt{\dfrac{x^2-1}{x-2}} = \lim_{x \to +\infty} \sqrt{\dfrac{x^2-1}{x^2(x-2)}} = 0$ confront infini

NON HO AS. ORIZZONTALI NĒ OBLIQUI

$$f'(x) = \frac{1}{2\sqrt{\frac{x^2-1}{x-2}}} \cdot \frac{2x\cdot(x-2)-(x^2-1)\cdot 1}{(x-2)^2} = \frac{1}{2\sqrt{\frac{x^2-1}{x-2}}} \cdot \frac{2x^2-4x-x^2+1}{(x-2)^2} =$$

$$= \frac{1}{2\sqrt{\frac{x^2-1}{x-2}}} \frac{x^2-4x+1}{(x-2)^2}$$

f ē derivabile

$\forall x \in (-1,1) \cup (2,+\infty)$

$$\lim_{x\to 1^-} f'(x) = \lim_{x\to 1^-} \frac{1}{2\underbrace{\sqrt{\frac{x^2-1}{x-2}}}_{\to 0^+}} \underbrace{\frac{x^2-4x+1}{(x-2)^2}}_{\to \frac{-2}{1}} = -\infty$$

in $x=1$ TANGENTE VERTICALE

$$\lim_{x\to -1^+} f'(x) = \lim_{x\to (-1)^+} \frac{1}{2\underbrace{\sqrt{\frac{x^2-1}{x-2}}}_{\to 0^+}} \cdot \underbrace{\frac{x^2-4x+1}{(x-2)^2}}_{\to \frac{6}{9}} = +\infty$$

in $x=-1$ TANG VERTICALE

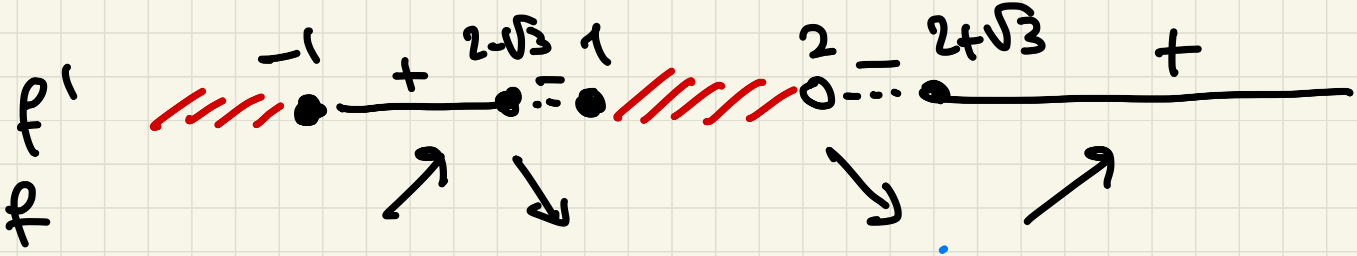
$$f'(x)\geq 0 \iff \frac{x^2-4x+1}{\underbrace{2\sqrt{\frac{x^2-1}{x-2}}}_{\vee 0}\ \underbrace{(x^2-1)^2}_{\vee 0}}\geq 0 \iff x^2-4x+1\geq 0$$

$$x_{1,2}=2\pm\sqrt{4-1}$$
$$=2\pm\sqrt{3}$$

$\iff$ $x\leq 2-\sqrt{3}$ $\quad$ $x\geq 2+\sqrt{3}$ $\quad$ $\sqrt{3}\sim 1,7..$

$\sim 0,3..$ $\quad$ $\sim 3,7..>2$

$\in(-1,1)$

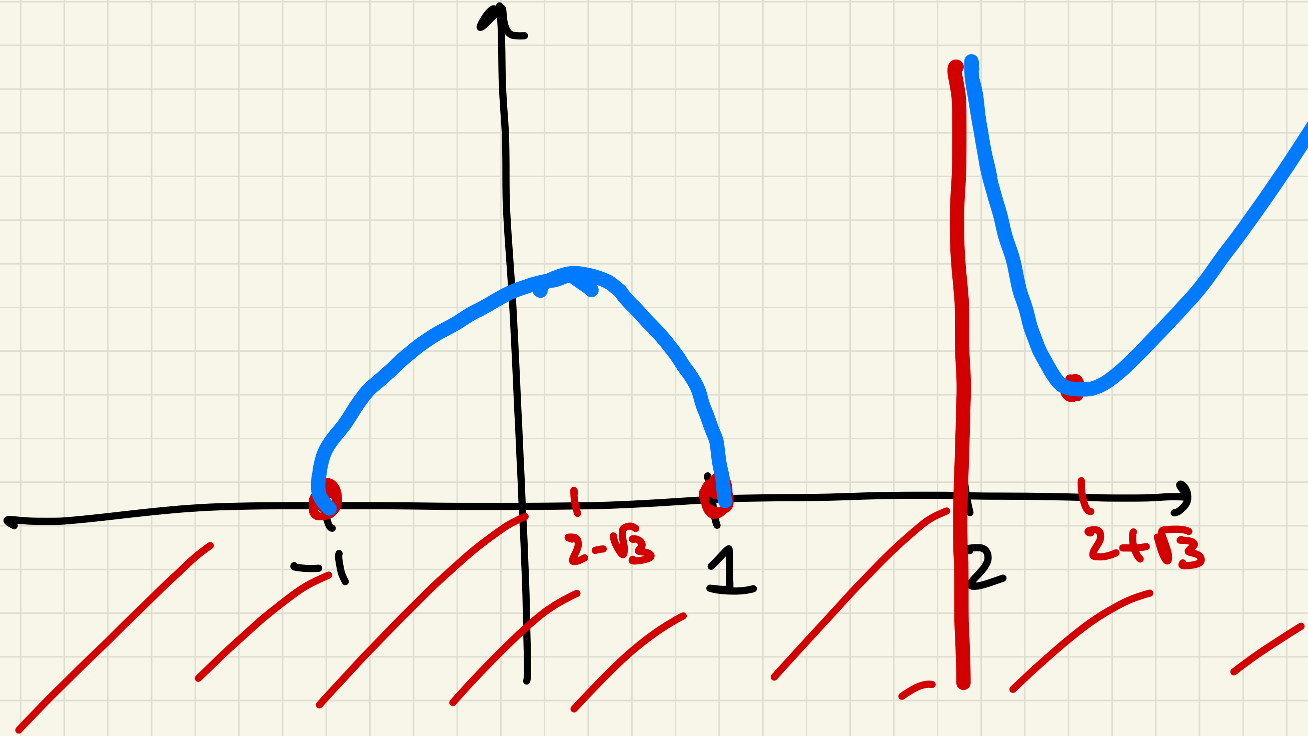


$x=2-\sqrt{3}$ pto di max locale (NON ASSOLUTO $\Rightarrow$ sup $f=+\infty$)

$x=-1$ pto di min. locale e ASSOLUTO $\quad$ $f(x)\geq 0=f(1)=f(-1)$

$x=1$ pto di min locale e ASSOLUTO $\quad$ min $f=0$

$x=2+\sqrt{3}$ pto di min locale NON ASSOLUTO



8) $f(x) = \sqrt[3]{x^2 e^x} = \sqrt[3]{x^2}\,\sqrt[3]{e^x} = x^{2/3} e^{x/3}$ $\quad D = \mathbb{R}$

dato che $\underset{\forall x}{x^2 e^x} \geq 0 \Rightarrow f(x) \geq 0 \; \forall x \in \mathbb{R}$ $\quad \boxed{f(0) = 0 = \min f}$

$$\lim_{x\to+\infty}\sqrt[3]{x^2e^x}=+\infty \qquad \lim_{x\to+\infty}\frac{\sqrt[3]{x^2e^x}}{x}=\lim_{x\to+\infty}\frac{e^{x/3}}{x^{1/3}}=+\infty$$

$$\frac{x^{2/3}e^{x/3}}{x}$$

↓ confronto tra infiniti

non ci sono as. obliqui e orizzontali a $+\infty$

$$\lim_{x\to-\infty}\underbrace{\sqrt[3]{x^2}}_{+\infty}\,\underbrace{e^{x/3}}_{0}=0$$ per confronto infiniti

$y=0$ AS. ORIZZONTALE a $-\infty$

$$f'(x)=\frac{2}{3}x^{2/3-1}e^{x/3}+x^{2/3}e^{x/3}\cdot\frac{1}{3}=\frac{1}{3}e^{x/3}\left(2x^{-1/3}+x^{2/3}\right)=$$

$$=\frac{x^{-1/3}e^{x/3}}{3}(2+x)=\frac{e^{x/3}}{3x^{1/3}}(2+x)$$ definita $\forall x\neq 0$ (NB $x^{2/3}\cdot x^{1/3}=x$)

$$\lim_{x\to0^+}\frac{\overset{\to1}{e^{x/3}}\,\overset{\to2}{(2+x)}}{3\,\underset{\to0^+}{x^{1/3}}}=+\infty$$

$$\lim_{x\to0^-}\frac{\overset{1}{e^{x/3}}\,\overset{\to2}{(2+x)}}{3\,\underset{\to0^-}{x^{1/3}}}=-\infty$$

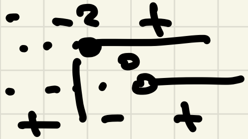
in $x=0$ f non è derivabile

$x=0$ PUNTO DI CUSPIDE

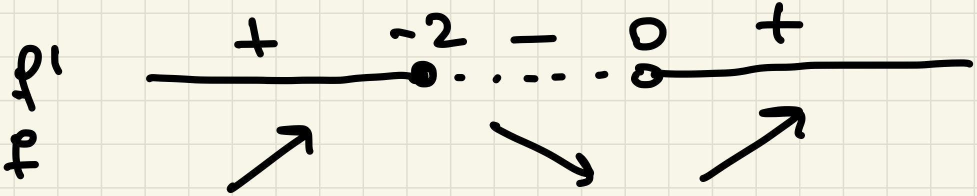
$f'(x) \geq 0$ $\quad 0 < \boxed{e^{x/3}}$ $\dfrac{e^{x/3}(2+x)}{3x^{1/3}} \geq 0$

$2+x \geq 0 \quad x \geq -2$

$x^{1/3} > 0 \quad x > 0$



$f'(x) \geq 0 \quad x \leq -2, \quad x > 0$



x = -2 pto di max locale (NON ASSOLUTO) sup f = +∞

x = 0 pto di min locale e ASSOLUTO

f(0) = min f = 0

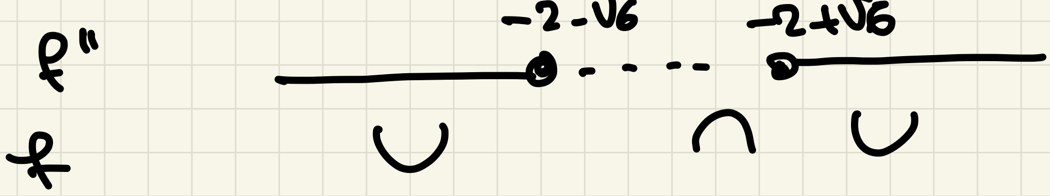
$$f''(x) = \frac{\left(\frac{1}{3}e^{x/3}(2+x) + e^{x/3}\cdot 1\right)3x^{1/3} - e^{x/3}(2+x)\,3\cdot\frac{1}{3}x^{-2/3}}{9x^{2/3}} =$$

$$= \frac{(2+x)x^{1/3}e^{x/3} + 3x^{1/3}e^{x/3} - (2+x)e^{x/3}x^{-2/3}}{9x^{2/3}} =$$

$$= \frac{e^{x/3}\cdot x^{-2/3}}{9x^{2/3}}\left[(2+x)\cdot x + 3x - (2+x)\right] = \frac{\overset{>0}{e^{x/3}}}{9\underset{>0}{x^{4/3}}}\underline{\underline{(x^2+4x-2)}}$$

$$f''(x) \geq 0 \iff x^2+4x-2 \geq 0 \qquad x = \frac{-4 \pm \sqrt{16+8}}{2} = \frac{-4 \pm 2\sqrt{6}}{2} = -2 \pm \sqrt{6}$$

$x \geq -2+\sqrt{6} \sim 0,\ldots \qquad x \leq -2-\sqrt{6} \cong -4,\ldots$



f convessa

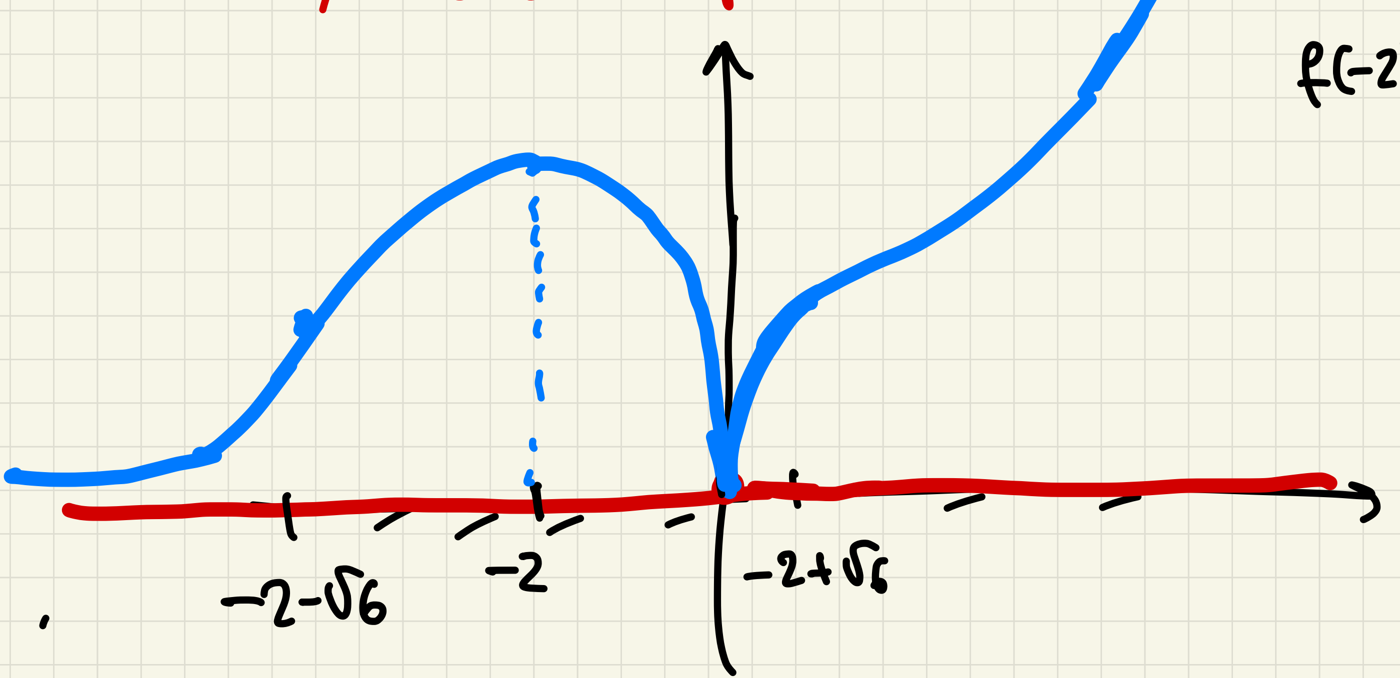
$x \geq -2+\sqrt{6}$

$x \leq -2-\sqrt{6}$

concava

$-2-\sqrt{6} \leq x \leq -2+\sqrt{6}$

$x=-2+\sqrt{6}$, $x=-2-\sqrt{6}$ sono pti di FLESSO



$f(-2)=4^{1/3}e^{-2/3}$