Lezione n° 5

$$y = \operatorname{arctg} \frac{|x|+1}{|x|-1}$$

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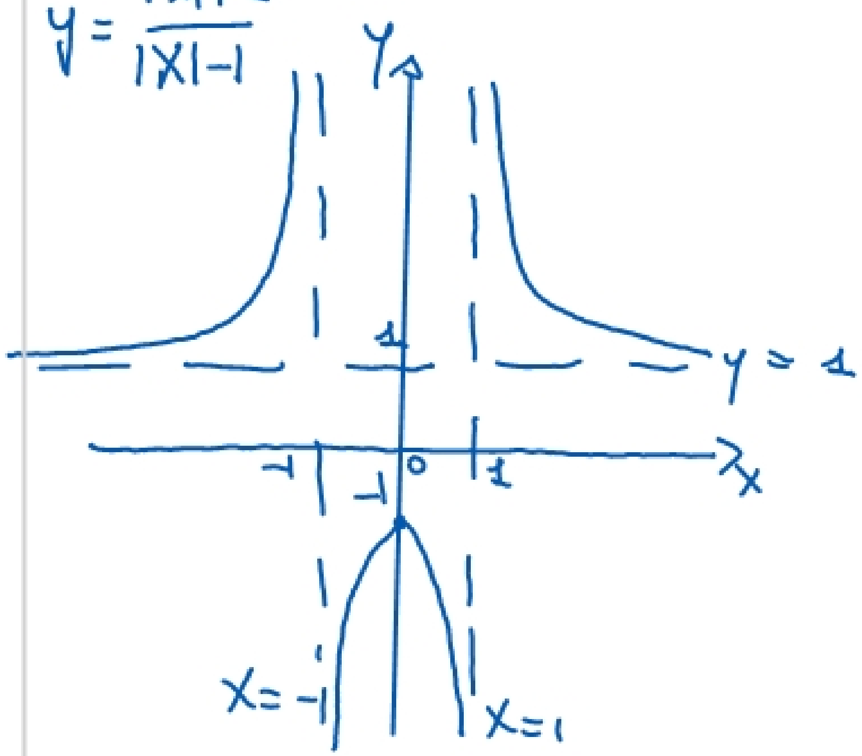
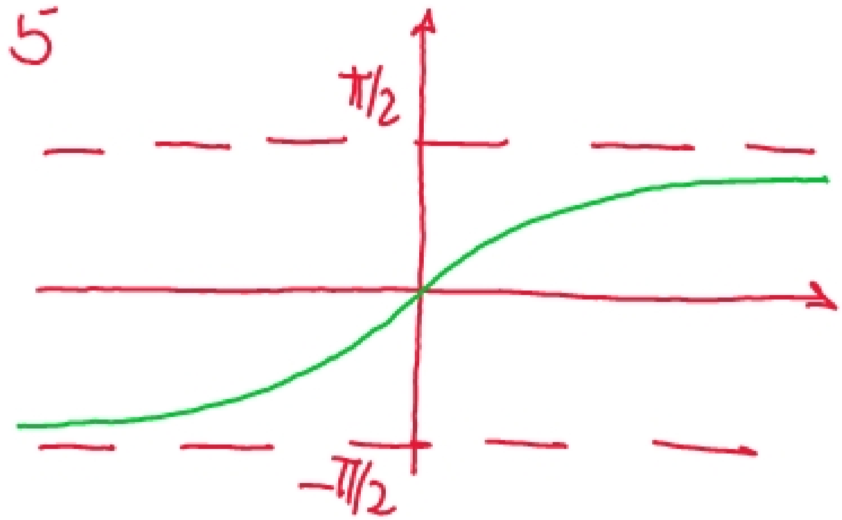
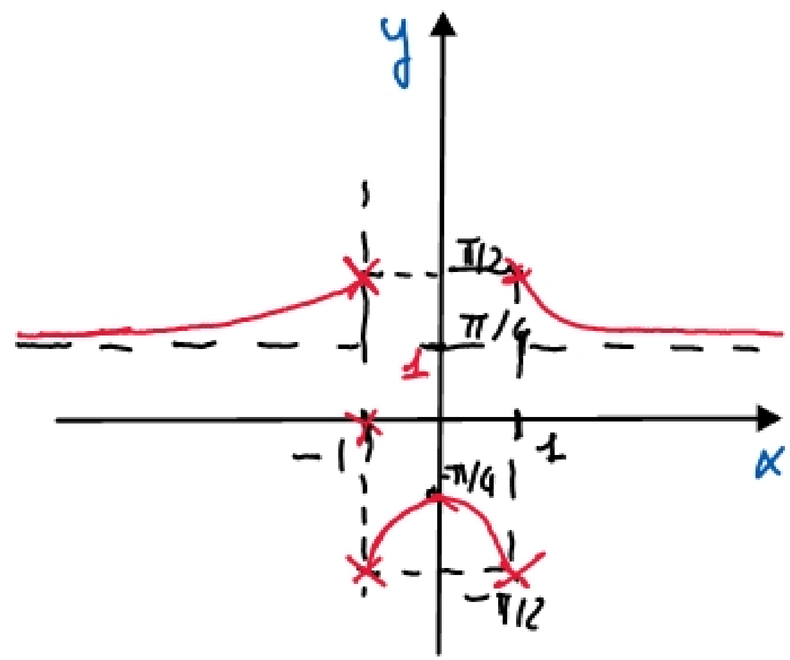






DOMINIO $f(x)$: $]-\infty, -1[\; \cup \;]-1, 1[\; \cup \;]1, +\infty[$

$\mathbb{R} \setminus \{-1, 1\}$

$]-\infty, -1[$ <u>aperto</u>

superiormente limitato : $\sup = -1$

inferiormente illimitato

$]1, +\infty[$ <u>aperto</u>

superiormente illimitato

inferiormente limitato $\inf = 1$

$]-1, 1[$ <u>aperto</u>

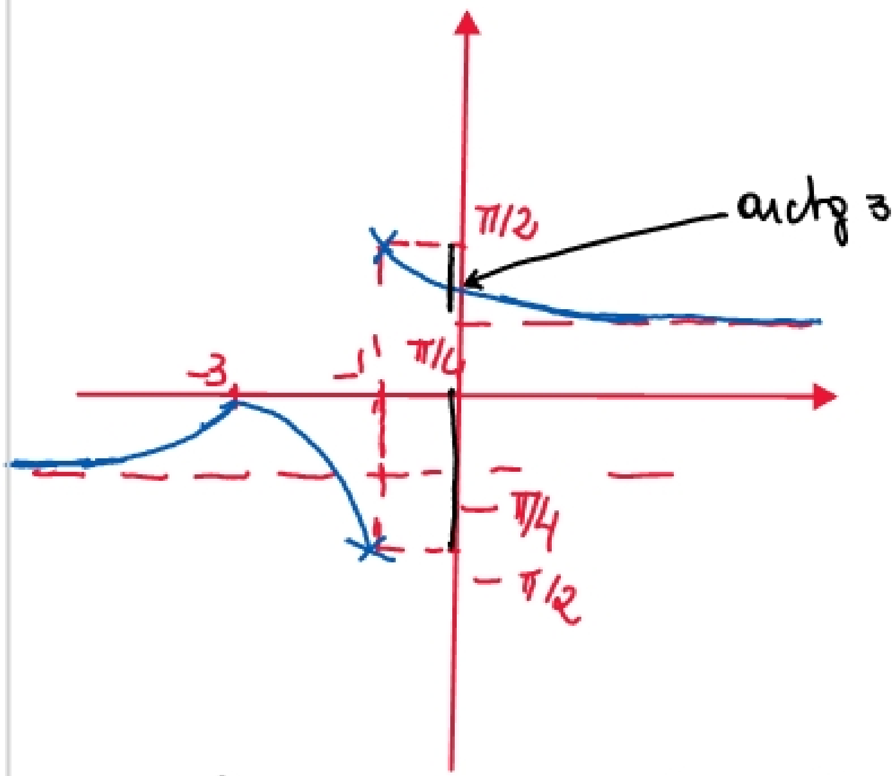
limitato $\sup = 1$

$\inf = -1$

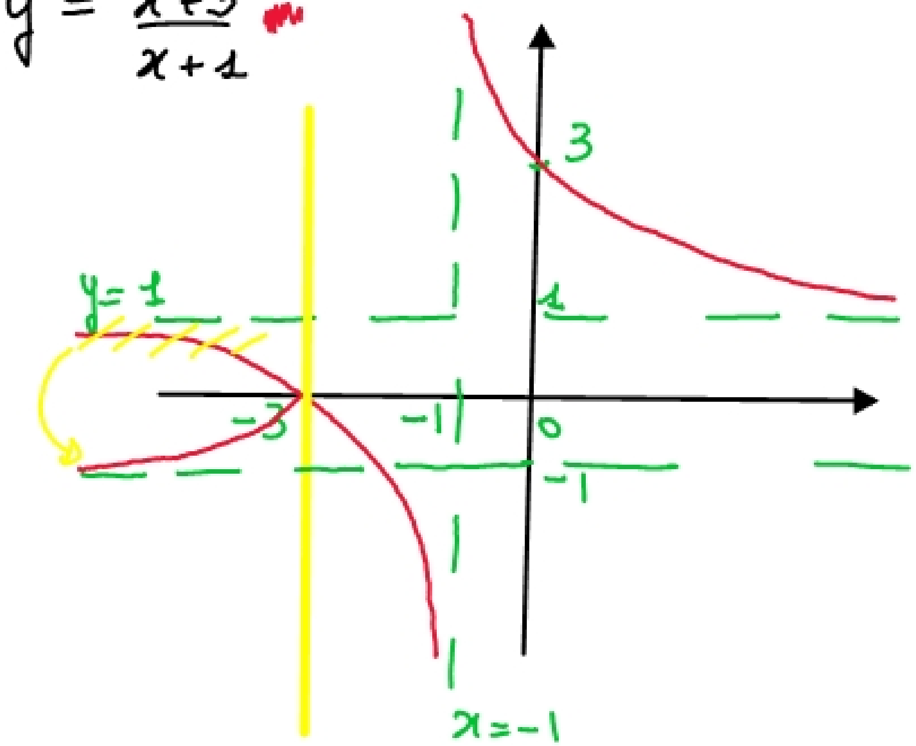
punti $1, -1$ sono di accumulazione

$$y = \operatorname{arctg} \frac{|x+3|}{x+1}$$

$$y = \frac{|x+3|}{x+1} \begin{cases} \dfrac{x+3}{x+1} & x \geq -3, \; x \neq -1 \\ -\dfrac{x+3}{x+1} & x < -3 \end{cases}$$



$$y = \frac{x+3}{x+1}$$



$$\operatorname{Im} f : \;]-\pi/2, 0] \cup]\pi/4, \pi/2[$$

$\text{Im} f$: $\quad]-\pi/2, 0] \cup]\pi/4, \frac{\pi}{2}[$

$]-\pi/2, 0]$ limitato
chiuso a destra $\quad$ $\sup = \text{Max} = 0$
aperto a sinistra $\quad$ $\inf = -\pi/2$

$]\pi/4, \pi/2[$ aperto
limitato

$\inf = \pi/4$
$\sup = \pi/2$] punti di acc.

$$y = \log|\text{sen}\,x - \sqrt{3}\cos x|$$

$$y = \text{sen}\,x - \sqrt{3}\cos x =$$

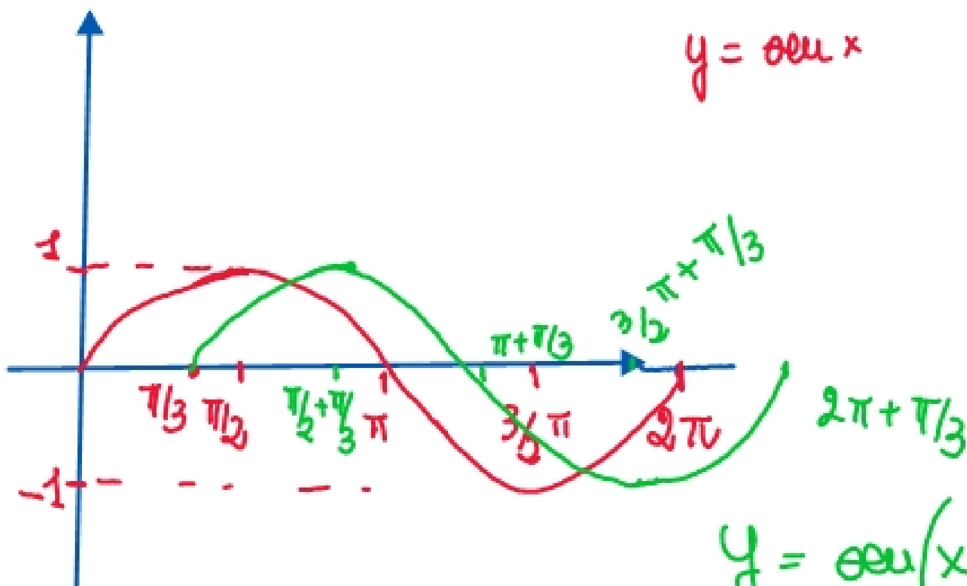
$$= 2\,\text{sen}\left(x - \frac{\pi}{3}\right)$$

$$\text{sen}\left(x - \frac{\pi}{3}\right) =$$

$$= \text{sen}\,x \cos\frac{\pi}{3} - \cos x\,\text{sen}\frac{\pi}{3} =$$

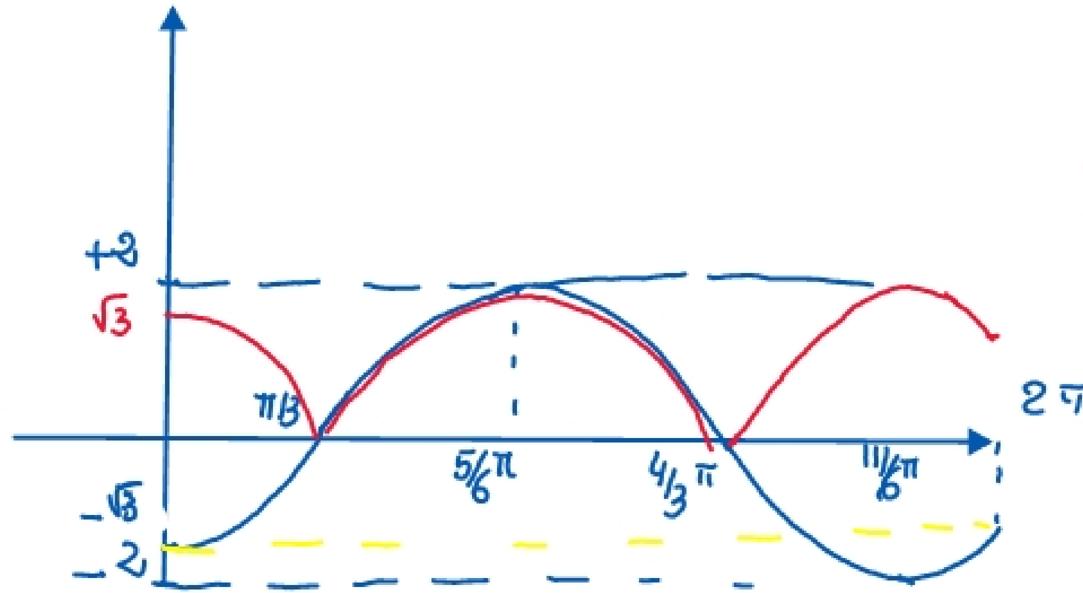
$$= \frac{1}{2}\text{sen}\,x - \frac{\sqrt{3}}{2}\cos x =$$

$$= \frac{1}{2}\left(\text{sen}\,x - \sqrt{3}\cos x\right)$$



$$y = \text{sen}\left(x + \frac{\pi}{3}\right)$$

$y = 2|\text{sen}(x - \pi/3)|$



$y = \log|\text{sen}\,x - \sqrt{3}\cos x| = \log(2\,|\text{sen}\,(x - \pi/3)|)$

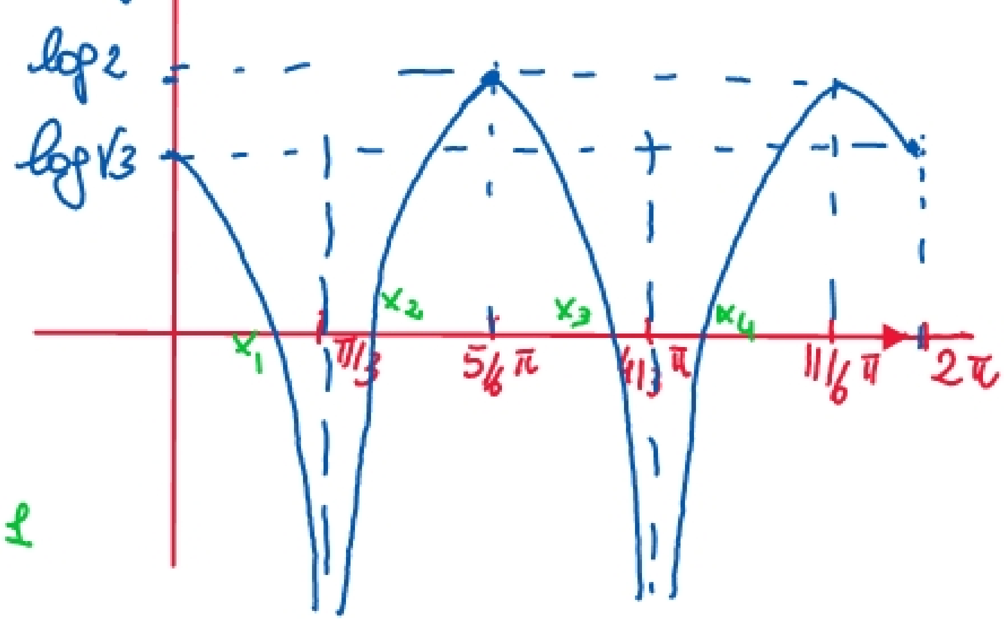
Zeri di $f(x)$

$\log(\ldots) = 0$

$(\ldots\ldots) = 1$

$\Downarrow$

$2|\text{sen}(x - \pi/3)| = 1$



$|\text{sen}(x - \frac{\pi}{3})| = 1/2$

$\text{sen}(x - \pi/3) = +\frac{1}{2}$

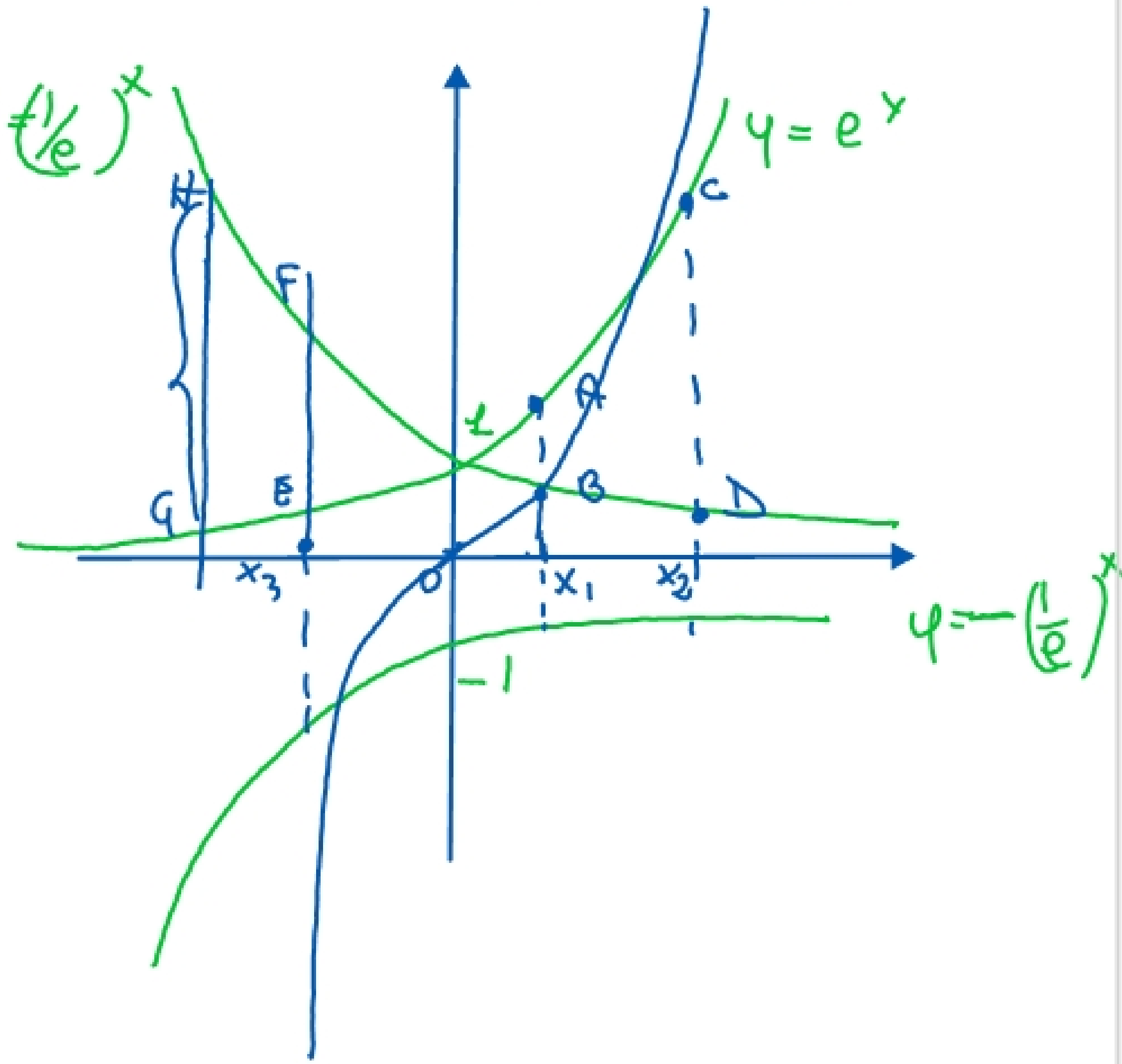
$\text{sen}(x - \pi/3) = -\frac{1}{2}$

$\uparrow$ x_1, x_2, x_3, x_4

FUNZIONI IPERBOLICHE

$$y = \sinh x = \frac{e^{x} - e^{-x}}{2} = \text{senoiperbolico}(x)$$

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



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dispari

$f(-x) = -f(x)$

crescente

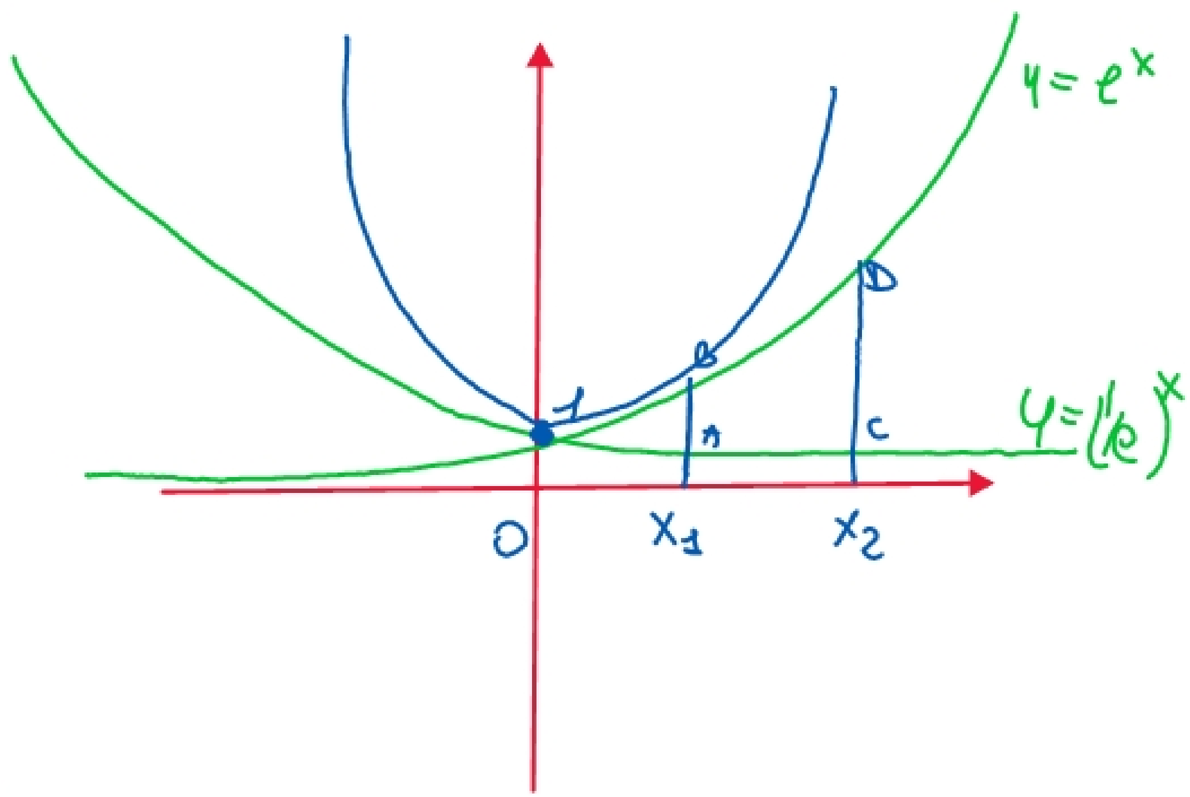
illimitata

$\forall x \in \mathbb{R}$ (dom f)

$$y = \cosh x = \frac{e^x + e^{-x}}{2}$$

coseno iperbolico di x

$$y = \frac{1}{2}\left(e^x + \left(\frac{1}{e}\right)^x \right)$$



$f(x) = f(-x)$

pari

decrescente $]-\infty, 0]$

crescente $[0, +\infty[$

limitato inferiormente   min 1   (per $x = 0$)

$\forall x \in \mathbb{R}$ dom f

$$y = \operatorname{tgh} x = \frac{\operatorname{senh} x}{\cosh x} = \frac{\frac{e^x - e^{-x}}{2}}{\frac{e^x + e^{-x}}{2}} = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

$$y = \operatorname{ctgh} x = \frac{\cosh x}{\operatorname{senh} x} = \frac{1}{\operatorname{Tgh} x} = \frac{e^x + e^{-x}}{e^x - e^{-x}}$$