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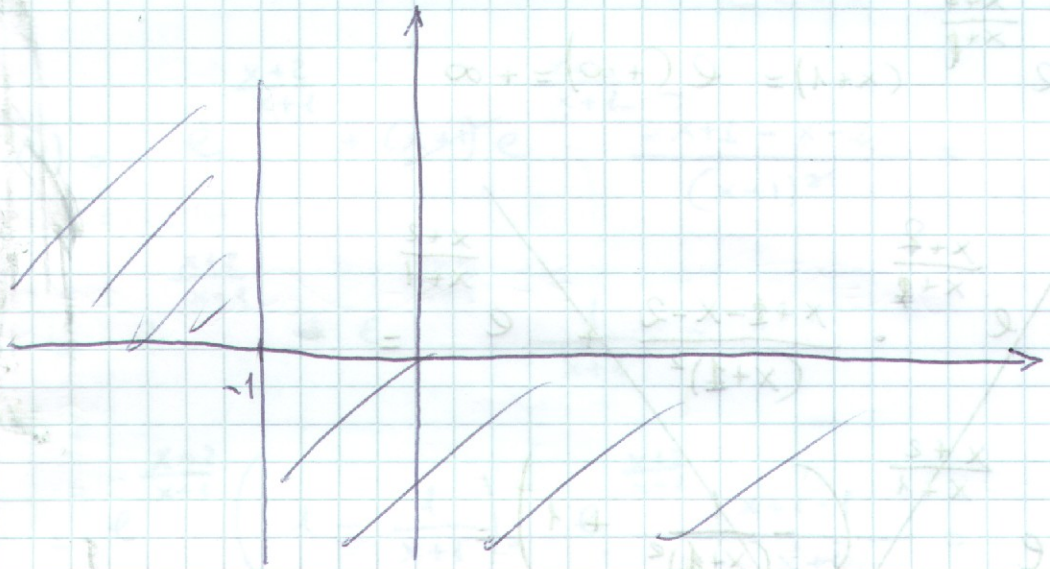
Del Prete luglio '80

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

CE: $x+1 \neq 0 \quad x \neq -1$ ee: $\mathbb{R} - \{-1\}$

POSITIVITÀ

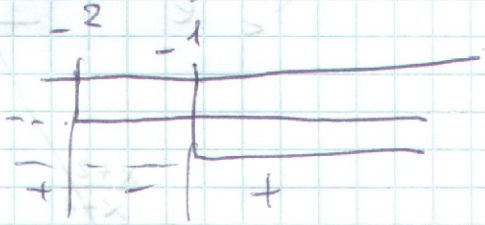
$f(x) > 0 \quad x+1 > 0 \quad x > -1$



Intersezione con l'asse y: $x=0 \quad f(0) = 1 \cdot e^2 = e^2$

con l'asse x $\quad f(x) = 0 \quad x+1 = 0 \quad x = -1 \notin CE$

$$\lim_{x \to -1^-} (x+1) e^{\frac{x+2}{x+1}} = 0 \cdot e^{-\infty} = 0$$



$$\lim_{x \to -1^+} (x+1) e^{\frac{x+2}{x+1}} = 0 \cdot e^{+\infty}$$

$$= \lim_{x \to -1^+} \frac{e^{\frac{x+2}{x+1}}}{\frac{1}{x+1}} = \lim_{x \to -1^+} \frac{e^{\frac{x+2}{x+1}} \cdot \frac{x+1-x-2}{(x+1)^2}}{-\frac{1}{(x+1)^2}} =$$

$$= \lim_{x \to -1^+} e^{\frac{x+2}{x+1}} = +\infty$$

$$\lim_{x\to-\infty} e^{\frac{x+2}{x+1}}(x+1) = e^{1}\cdot(-\infty) = -\infty$$

$$= \lim_{x\to-\infty} \frac{e^{\frac{x+1}{x+2}}}{\frac{1}{x+1}} = \text{Ci}$$

$$\lim_{x\to+\infty} e^{\frac{x+2}{x+1}}(x+1) = e(+\infty) = +\infty$$

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

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

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

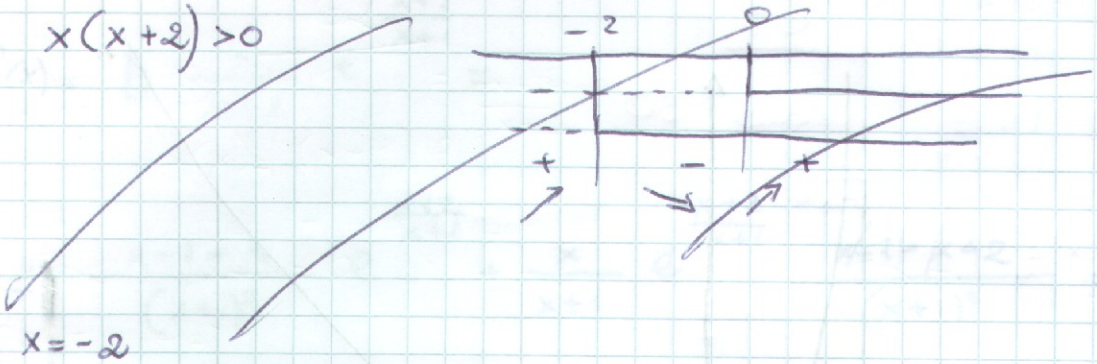
$$= e^{\frac{x+2}{x+1}} \frac{x^2 + 2x}{(x+2)^2}$$

$f'(x) = 0 \quad \left(x^2 + 2x + 3 = 0 \right) \quad \Delta < 0$

$f'(x) = 0$ mai

$f'(x) > 0 \quad \forall x$

$x(x+2) > 0$



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

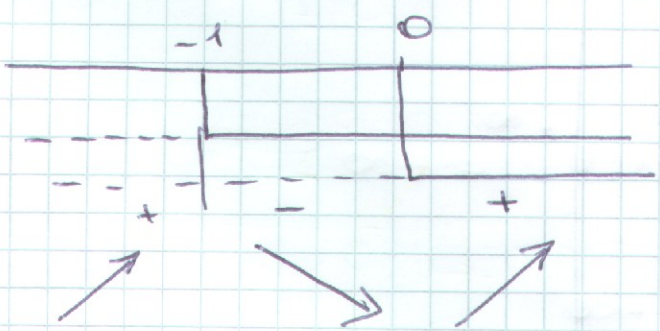
$$f'(x) = e^{\frac{x+2}{x+1}} + (x+1)\, e^{\frac{x+2}{x+1}} \cdot \frac{x+1-x-2}{(x+1)^2} =$$

$$= e^{\frac{x+2}{x+1}} + e^{\frac{x+2}{x+1}} \cdot \frac{1}{x+1} =$$

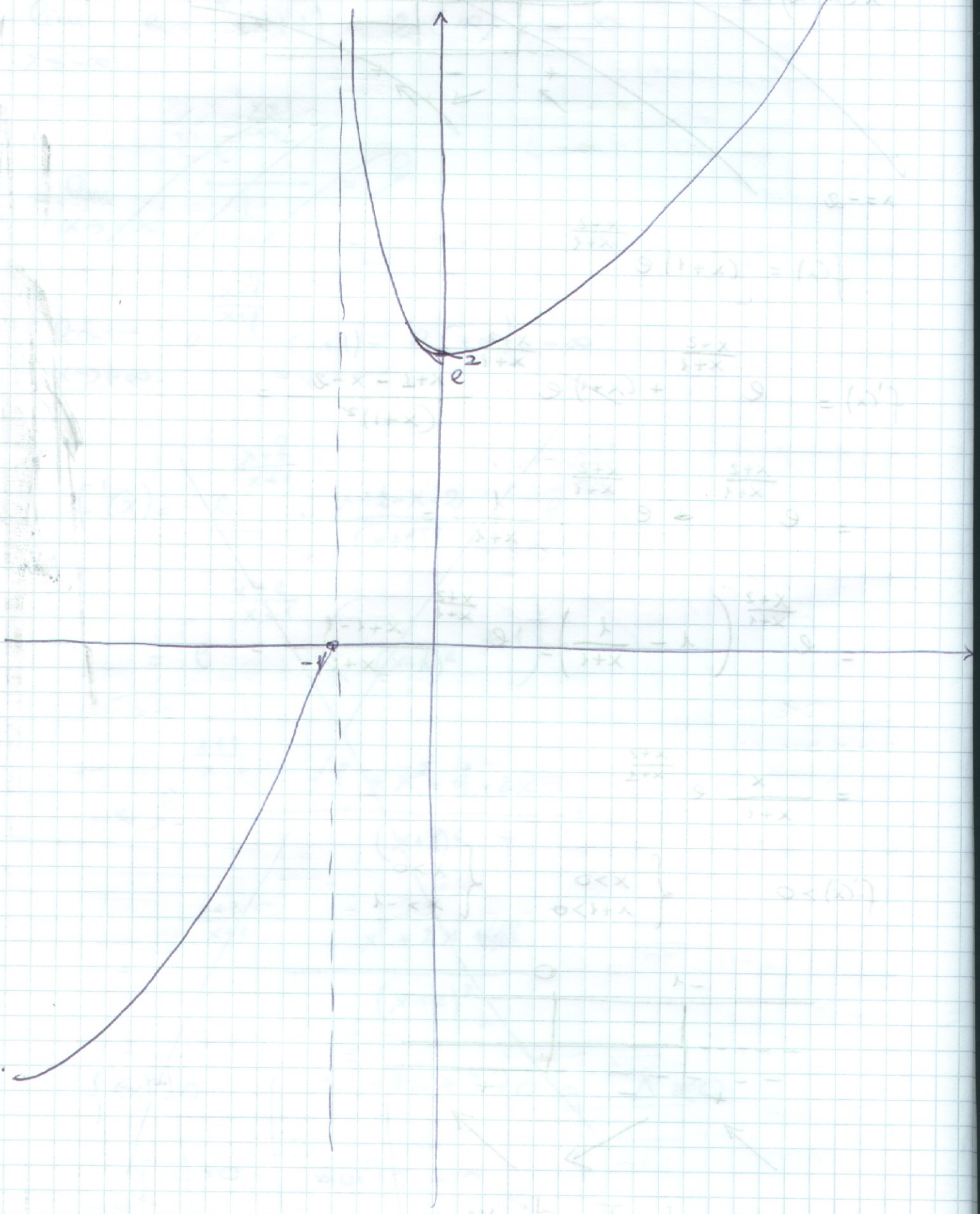
$$= e^{\frac{x+2}{x+1}} \left(1 - \frac{1}{x+1}\right) = e^{\frac{x+2}{x+1}} \cdot \frac{x+1-1}{x+1} =$$

$$= \frac{x}{x+1}\, e^{\frac{x+2}{x+1}}$$

$f'(x) > 0 \qquad \begin{cases} x > 0 \\ x+1 > 0 \end{cases} \qquad \begin{cases} x > 0 \\ x > -1 \end{cases}$



$x = 0$ punto di min


e^{-2}
$-e$

$$f''(x) = D\left(\frac{x}{x+1}\, e^{\frac{x+2}{x+1}}\right) =$$

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

$$= \frac{1}{(x+1)^2}\, e^{\frac{x+2}{x+1}} + \frac{x}{(x+1)^3}\, e^{\frac{x+2}{x+1}} =$$

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

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

$$= \frac{1}{(x+1)^2}\, e^{\frac{x+2}{x+1}} > 0 \quad \forall x$$

$f(x)$ sempre convessa