

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

$$CE: \mathbb{R}$$

Positivita':  $f(x) > 0 \quad \forall x \neq 0$

Intersezione con gli assi

asse y:  $x = 0 \Rightarrow y = 0 \cdot e^0 = 0$

asse x:  $y = 0 \Rightarrow x = 0$

MAX  $\in \mathbb{R}$

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

$$m = \lim_{x \rightarrow -\infty} x e^{-x} = +\infty$$

$$\lim_{x \rightarrow +\infty} x^2 e^{-x} = 0$$

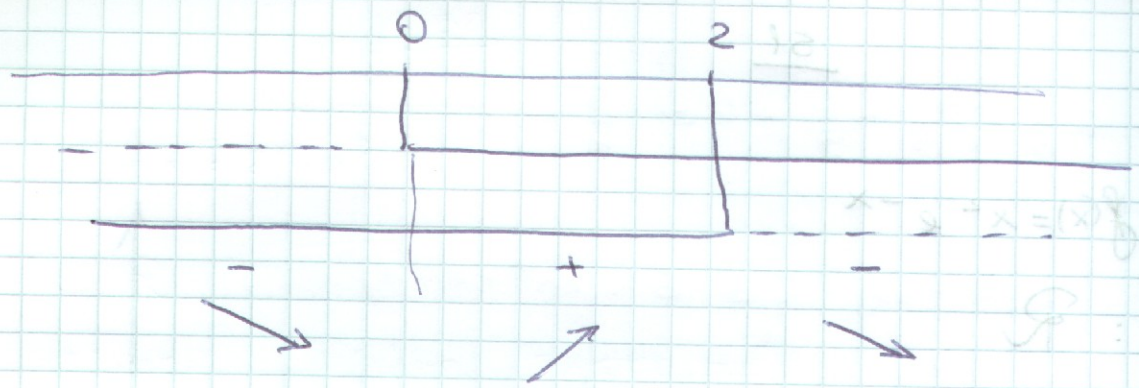
$$\lim_{x \rightarrow +\infty} \frac{x^2}{e^x} = 0$$

MAX  $\in \mathbb{R}$

$$f'(x) = 2x e^{-x} - x^2 e^{-x} = e^{-x} x (2-x)$$

$$f'(x) = 0 \quad x=0, x=2$$

$$f'(x) > 0 \quad \begin{cases} x > 0 \\ 2-x > 0 \end{cases} \quad \begin{cases} x > 0 \\ x < 2 \end{cases}$$



$x=0$  punto di min  $f(0) = 0$

$x=2$  punto di max  $f(2) = 4e^{-2}$

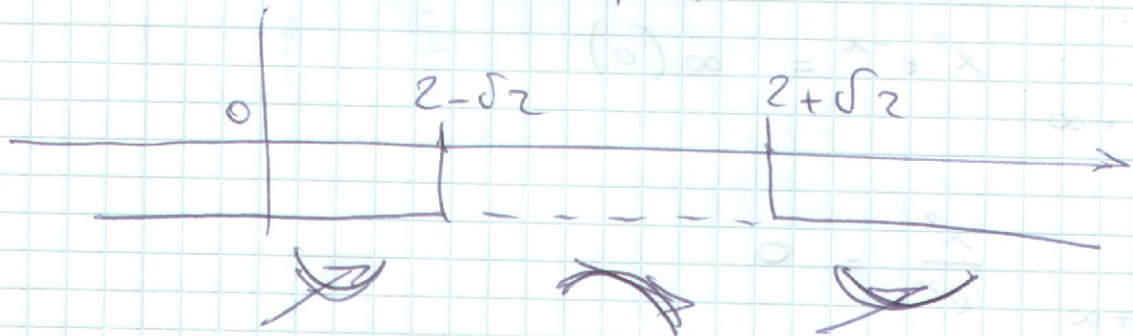
CONCAVITA' E CONVESSITA'

$$f''(x) = -e^{-x}(2x - x^2) + e^{-x}(2 - 2x) =$$

$$= e^{-x}(-2x + x^2 + 2 - 2x) = e^{-x}(x^2 - 4x + 2)$$

$x = 2 \pm \sqrt{2}$

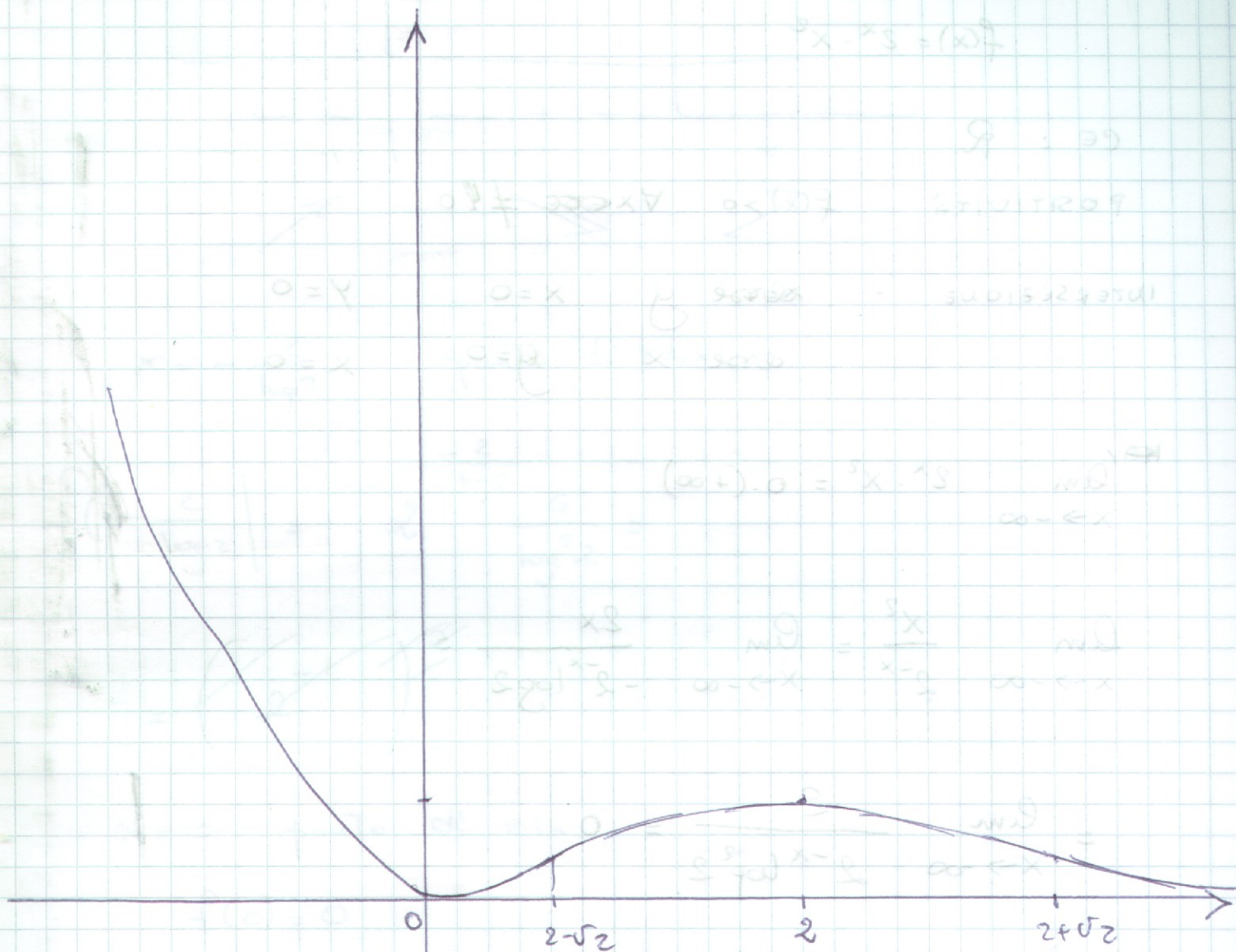
$f''(x) > 0$   $x < 2 - \sqrt{2}$  ;  $x > 2 + \sqrt{2}$



$x = 2 - \sqrt{2}$  punto di max

$$f(2 - \sqrt{2}) = (2 - \sqrt{2}) e^{-2 + \sqrt{2}}$$

$x = 2 + \sqrt{2}$  punto di min



$$f(x) = 2x^3 - x^2$$

$$f'(x) = 6x^2 - 2x$$

$$f''(x) = 12x - 2$$

$$y = 0$$

$$x = 0$$

$$x = \frac{1}{6}$$

$$x = \frac{1}{6}$$

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow \infty} \frac{f(x)}{x^3} = 2$$

$$\lim_{x \rightarrow -\infty} \frac{f(x)}{x^3} = 2$$

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow \infty} \frac{f(x)}{x^3} = 2$$

$$\lim_{x \rightarrow -\infty} \frac{f(x)}{x^3} = 2$$

$$f(x) = 2x^3 - x^2 = x^2(2x - 1)$$

$$x > 0$$

$$x = 0$$

$$f'(x) = 0$$

$$x < 0$$

$$x = 0$$

$$f'(x) = 0$$