Metodi Matematici - Ex. 10

Titolo nota

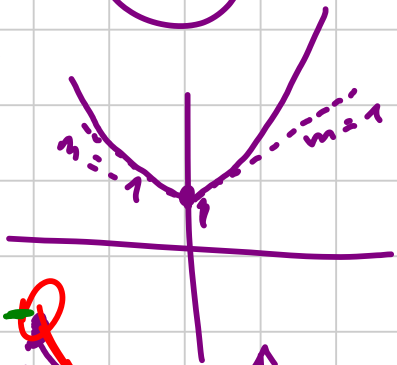
5 dicembre 2017 (8:30-9.15) - docente: Prof. **Emanuele Callegari** - Università di Roma ***Tor Vergata***

EX. 1

CALCOLARE f' : $f(x) = \underbrace{e^{|2x-3|}\chi_{(-2,2)}(x)}_{h(x)} + \underbrace{x^2 \arctan x^2}$

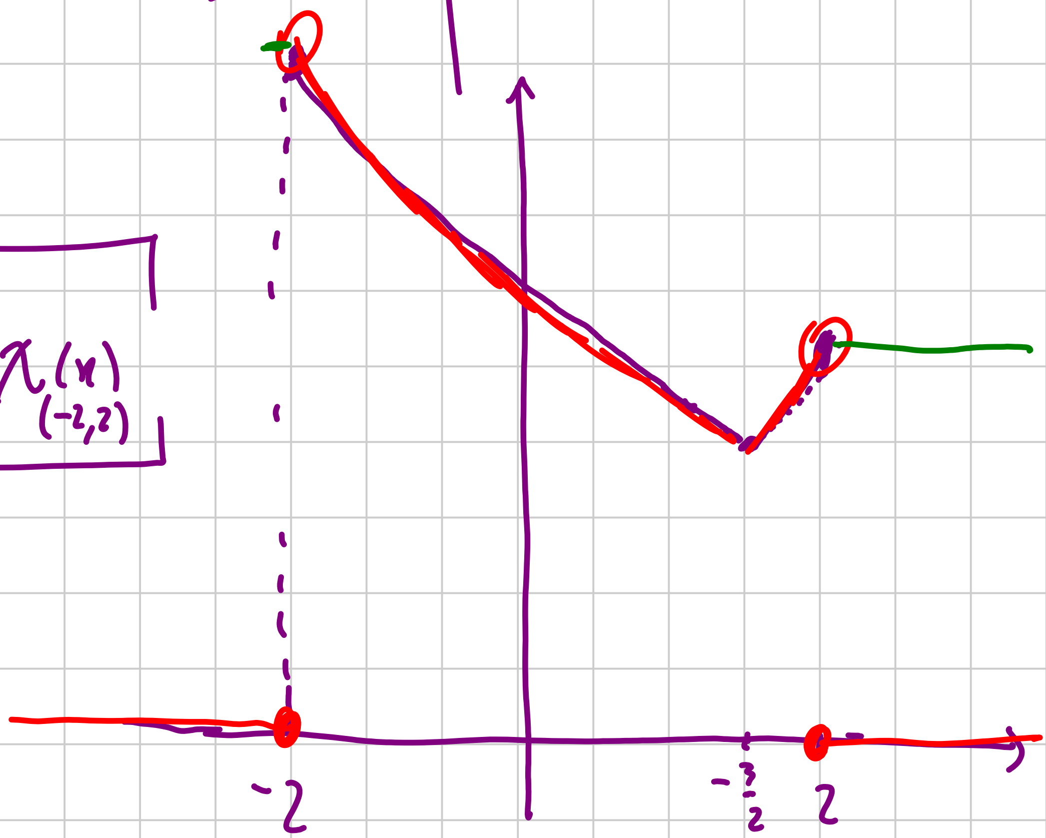
$$e^{|2x-3|} = e^{|2(x-\frac{3}{2})|}$$

$e^{|x|}$ $\longrightarrow$



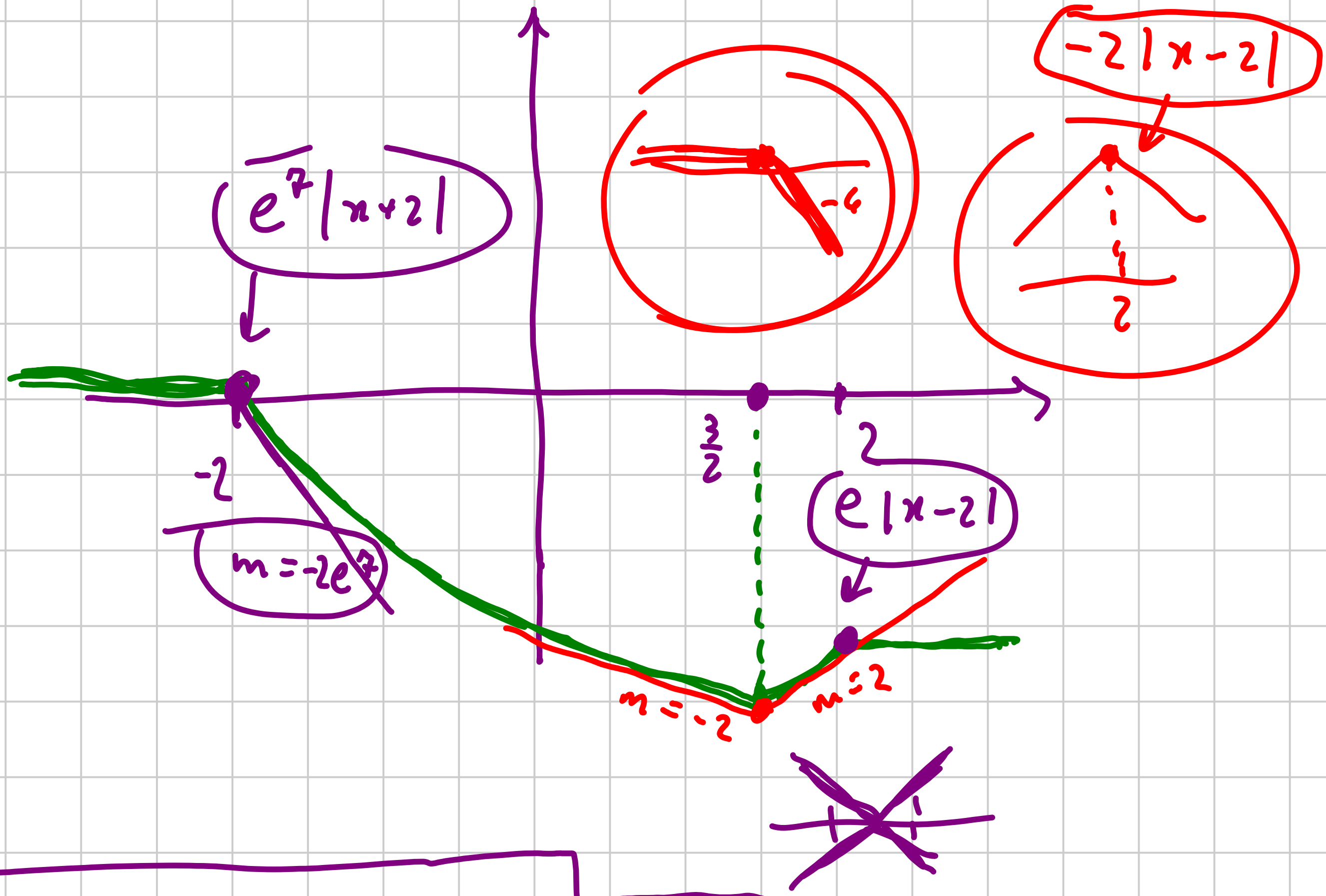
$e^{|2x|}$

$$\boxed{e^{|2(x-\frac{3}{2})|}\chi_{(-2,2)}(x)}$$



$$h(x) = \underbrace{e^{|2x-3|}\cdot\chi(x) + e\,S(2)}\, - \underbrace{e\,S(2)} + e^7 S(-2) \underbrace{- e^7 S(-2)} =$$

$$= \underbrace{e^{|2x-3|}\chi(x) + e\,S(2) - e^7 S(-2)}_{g(x)}\, \underbrace{- e\,S(2) + e^7 S(-2)}$$



$$\underbrace{e^{|2x-3|}\chi(x)+e\,\delta(2)-e^{7}\delta(-2)-2\left|x-\tfrac{3}{2}\right|}_{v(x)}+2\left|x-\tfrac{3}{2}\right|-e\,\delta(2)+e^{7}\delta(-2)$$

$$h(x)=\overbrace{e^{|2x-3|}\chi_{(-2,2)}(x)+e\,\delta(2)-e^{7}\delta(-2)-2\left|x-\tfrac{3}{2}\right|+e^{7}|x+2|+e|x-2|}$$

$$+2\left|x-\tfrac{3}{2}\right|-e\,\delta(2)+e^{7}\delta(-2)-e^{7}|x+2|-e|x-2|$$

$$v(x)=\begin{cases}(2-e^{7}-e)x-3-2e^{7}+2e & x<-2\\ e^{-2x+3}-e^{7}+2\left(x-\tfrac{3}{2}\right)+e^{7}(x+2)-e(x-2) & -2<x<\tfrac{3}{2}\\ \cdots\cdots & \tfrac{3}{2}<x<2\\ \cdots\cdots & x>2\end{cases}$$

$$v'(x) = \begin{cases} \vdots \\ \vdots \end{cases}$$

$$\underbrace{+2\left|x-\tfrac{3}{2}\right| - e\,S(2) + e^{7} S(-2) - e^{7}|x+2| - e|x-2|} = u(x)$$

$$\underbrace{2S\left(\tfrac{3}{2}\right) - e\cdot\delta(2) + e^{7}\delta(-2) - e^{7}\cdot S(-2) - e\cdot S(2)}_{u'(x)}$$

$$h'(x) = \underbrace{v'(x) + u'(x)}$$

$$f(x) = h(x) + x^2 \arctan x^2$$

$$f'(x) = \underbrace{v'(x)} + \underbrace{u'(x)} + 2x \arctan x^2 + x^2 \cdot \frac{2x}{1+x^4}$$

Ex 2 $\quad f(x) = \underbrace{x e^{4x}} + \underbrace{|2x-1|\,\chi_{(-1,1)}(x)}_{h(x)}$

$$h(x) = \overbrace{\underbrace{\underbrace{|2x-1|}\,\chi_{(-1,1)}(x) - 3S(-1) + S(1)}} \overbrace{+3S(-1) - S(1)}$$

$-1 \quad S = 3$

$1 \quad S = -1$

$$x_0 = \frac{1}{2} \longrightarrow -2\left|x - \frac{1}{2}\right|$$

$$x_0 = 1 \longrightarrow |x-1|$$

$$x_0 = -1 \longrightarrow |x+1|$$

$$|2x-1|\,\chi_{(-1,1)}(x) - 3S(-1) + S(1) + \overbrace{3S(-1) - S(1)}$$

$$\underbrace{|2x-1|\,\chi_{(-1,1)}(x) - 3S(-1) + S(1) - 2\left|x-\frac{1}{2}\right| + |x-1| + |x+1|}_{v(x)} +$$

$$\underbrace{+3S(-1) - S(1) + 2\left|x-\frac{1}{2}\right| - |x-1| - |x+1|}_{u(x)}$$

$$v(x) = \begin{cases} \vdots \;\; \text{———} & x < -1 \\ \vdots \;\; \text{———} & -1 < x < \frac{1}{2} \\ \vdots \;\; \text{———} & \frac{1}{2} < x < 1 \\ \vdots \;\; \text{———} & x > 1 \end{cases}$$

$$v'(x) = \begin{cases} \vdots \end{cases}$$

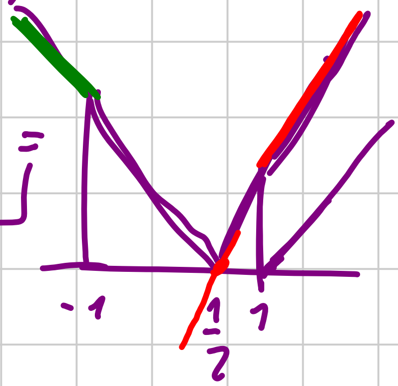
$$u'(x) = 3\delta(-1) - \delta(1) + 2S\left(\frac{1}{2}\right) - S(1) - S(-1)$$

$$h'(x) = v'(x) + u'(x)$$

$$f'(x) = v'(x) + u'(x) + \left(xe^{4x}\right)' = \dots$$

$\boxed{\text{OSS.}}$ $h(x) = |2x-1| \, \chi_{(-1,1)}(x) =$

$$\underbrace{\underbrace{|2x-1| - \underbrace{S(1)(2x-1)}}\ - (1-S(-1))(-2x+1)} =$$



$= \ldots\ldots$

$S(1)\,(2x-1)$