$$\lim_{x\to 0} \frac{\operatorname{sen}(x^2-x) - x^2 + x}{x^3}$$

- $\operatorname{sen}(\underbrace{x^2-x}) = x^2 - x + \underbrace{o(x^2-x)}_{o(x)}$

$$\lim_{x\to 0} \frac{\cancel{x^2} - \cancel{x} + o(x) - \cancel{x^2} + \cancel{x}}{x^3}$$

Non posso concludere

Uso! $\operatorname{sen}(x^2-x) = x^2 - x - \frac{1}{6}(x^2-x)^3 + o(x^3)$

$$\lim_{x\to 0} \frac{-\frac{1}{6}(x^2-x)^3 + o(x^3)}{x^3} = \lim_{x\to 0} \frac{\frac{1}{6}x^3 + o(x^3)}{x^3} = \boxed{\frac{1}{6}}$$

e

$$\lim_{x\to 0} \frac{e^{1+x}\left(1-\cos x+\log(1+x)-x\right)}{\sqrt{1-x^3}\;-1}$$

$$\boxed{(1+y)^2 = 1+2y+o(y) \qquad y\to 0}$$

$$\cos x = 1-\frac{1}{2}x^2+\frac{1}{4!}x^4+o(x^5)$$

$$\log(1+x) = x-\frac{1}{2}x^2+\frac{1}{3}x^3-\frac{1}{4}x^4+o(x^4)$$

$$\lim_{x \to 0} \frac{e\left(\cancel{1} - \cancel{x} + \frac{1}{2}\cancel{x^2} + o(x^3)\right) + \cancel{x} - \frac{1}{2}\cancel{x^2} + \frac{1}{3}x^3 + o(x^3) - \cancel{x}}{\cancel{1} - \frac{1}{2}x^3 + o(x^3) - \cancel{1}}$$

$$= \boxed{-\frac{2}{3}e}$$

$$\lim_{x\to 0} \frac{1 - e^{\operatorname{sen} x} + x}{\log(1+x^2)}$$

$$e^{\operatorname{sen} x} = e^{x + o(x^2)} \qquad x \to 0$$

$$e^{x+o(x^2)} = \underbrace{1 + x + o(x^2)}_{y} + \frac{o\left(x + o(x^2)\right)}{\underbrace{}_{o(x)}} \quad \text{per } x \to 0$$

avrei

$$\lim_{x\to 0} \frac{o(x)}{x^2 + o(x^2)}$$

non posso concludere

$$e^{\operatorname{sen} x} = e^{x+o(x^2)}$$

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

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

Quindi:

$$\lim_{x\to 0} \frac{-\frac{1}{2}x^2 + o(x^2)}{x^2 + o(x^2)} = \boxed{-\frac{1}{2}}$$

$$\lim_{x \to 2} \frac{e^{x-2} - 1 - \operatorname{sen}(x-2)}{1 - \sqrt{1-(x-2)^2}}$$

$$= \lim_{x \to 2} \frac{\cancel{1} + \cancel{x-2} + \frac{1}{2}(x-2)^2 + o(x-2)^2 - \cancel{1} - \left[\cancel{x-2} + o(x-2)^2\right]}{1 - \left(1 - \frac{1}{2}(x-2)^2 + o(x-2)^2\right)}$$

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

$$\lim_{x\to 0} \frac{\operatorname{sen}(x^2) - \log(1+x+x^2) + x - \frac{1}{2}x^2}{1 - e^{x^3}}$$

- $\operatorname{sen}(x^2) = x^2 + o(x^5)$
- $-\log(1+x+x^2) = -x - x^2 + \frac{1}{2}(x+x^2)^2 - \frac{1}{3}(x+x^2)^3 + o(x^3)$

Num: $\cancel{x^2} \cancel{-x} \cancel{-x^2} \cancel{+\frac{1}{2}x^2} + x^3 - \frac{1}{3}x^3 \cancel{+x} \cancel{-\frac{1}{2}x^2} + o(x^3)$

$\boxed{N = \frac{2}{3}x^3 + o(x^3)}$ D: $\cancel{1}\cancel{-1} - x^3 + o(x^3)$

$\lim_{x\to 0} \frac{N}{D} = \boxed{-\frac{2}{3}}$