$$\lim_{x \to +\infty} \frac{\ln x}{\ln(x+2)} = \frac{\infty}{\infty} \quad \text{F.1.} \quad [1]$$

$$= \lim_{x \to +\infty} \frac{\ln x}{\ln(x+2)} = \lim_{x \to +\infty} \frac{\ln x}{\ln(x+2)} =$$

$$\lim_{\underline{x} \to +\infty} \frac{(1-x)^{2x}}{(1+x^2)^x} = \frac{\infty}{\infty} \quad \text{F.1.} \qquad \left[\frac{1}{e^2} \right]$$

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

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

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

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$$=2=\frac{1}{2}$$

$$\lim_{x \to +\infty} x \left[\ln(x^2 + 4) - 2\ln x \right] = \begin{bmatrix} 0 \end{bmatrix}$$

$$= \lim_{x \to +\infty} x \left[\ln(x^2 + 4) - \ln x^2 \right] = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$= \lim_{x \to +\infty} x \left[\ln\left(\frac{x^2 + 4}{x^2}\right) \right] = \lim_{x \to +\infty} x \left[\ln\left(1 + \frac{4}{x^2}\right) \right] = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

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$$= \lim_{x \to +\infty} \ln\left(1 + \frac{4}{x^2}\right) = \lim_{x \to +\infty} \ln\left(1 + \frac{4}{x^2}\right) = \frac{1}{x^2} = 0$$

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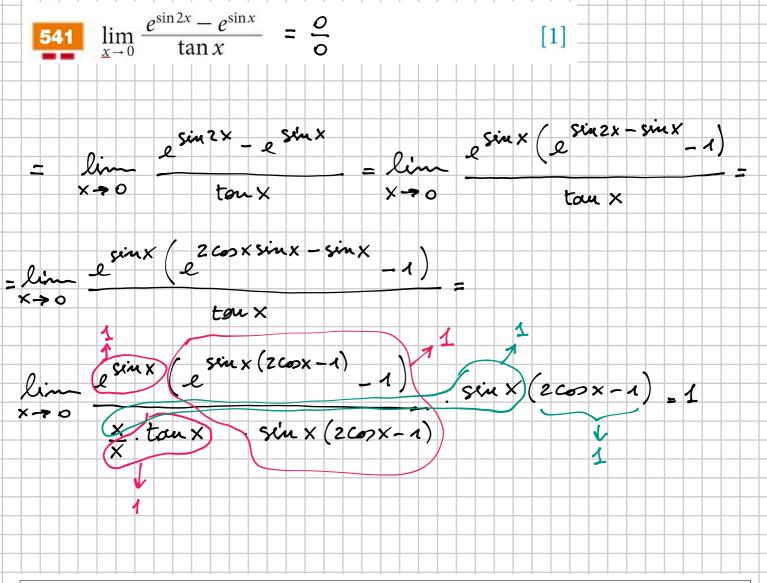
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$$= \lim_{x$$



se $f(x) \to 0$ per $x \to x_0$ senza annullarsi in un intorno di x_0 , escluso il punto x_0 stesso (cioè nei casi più frequenti), valgono le seguenti equivalenze per $x \to x_0$

$$\sin f(x) \sim f(x)$$

$$\tan f(x) \sim f(x)$$

$$1 - \cos f(x) \sim \frac{1}{2}f^2(x)$$

$$e^{f(x)} - 1 \sim f(x)$$

$$[1+f(x)]^{\alpha}-1\sim \alpha f(x) \quad (\alpha\in\mathbb{R})$$

$$ln(1+f(x)) \sim f(x)$$

$$\lim_{x \to 0} \frac{\sqrt[4]{1 + x^3} - 1}{x^3 - x^4} = \frac{0}{0} \qquad \left[\frac{1}{4}\right]$$

$$\frac{(1 + x^3)^4 - 1}{x^3 - x^4} \sim \frac{1}{4} \times \frac{3}{4} = \frac{1}{4}$$

$$\frac{1}{4} \times \frac{3}{4} = \frac$$