

CdL in BIOLOGIA

Matematica (corso B)

Esercizi sul teorema di de l'Hôpital

Utilizzando i limiti notevoli e/o il Teorema di De l'Hôpital calcolare i seguenti limiti.

- $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^2} = 0, \lim_{x \rightarrow 0} \frac{\sin x - x}{x^3} = -\frac{1}{6}, \lim_{x \rightarrow 0} \frac{\sin x - x}{x^5} = -\infty,$
- $\lim_{x \rightarrow 0} \frac{\sin x - x + \frac{x^3}{6}}{x^4} = 0, \lim_{x \rightarrow 0} \frac{\sin x - x + \frac{x^3}{6}}{x^5} = \frac{1}{120};$
- $\lim_{x \rightarrow 0} \frac{\cos x - 1 + \frac{x^2}{2}}{x^3} = 0, \lim_{x \rightarrow 0} \frac{\cos x - 1 + \frac{x^2}{2}}{x^4} = \frac{1}{24}, \lim_{x \rightarrow 0} \frac{\ln(\cos x + \frac{x^2}{2})}{\sin^{3/2}(x^{3/2})} = 0;$
- $\lim_{x \rightarrow 0} \frac{e^{\sin x - x} - 1}{\tan^3 x} = -\frac{1}{6}, \lim_{x \rightarrow 0} \frac{e^{\cos x - 1 + \frac{x^2}{2}} - 1}{\tan^3 x} = 0;$
- $\lim_{x \rightarrow 0} \frac{e^x - 1 - x - \frac{x^2}{2} - \frac{x^3}{6}}{x^4} = \frac{1}{24}, \lim_{x \rightarrow 0} \frac{\ln(e^x - x - \frac{x^2}{2} - \frac{x^3}{6})}{x^4} = \frac{1}{24};$
- $\lim_{x \rightarrow 0} \frac{\ln(1+x) - x}{x^2} = -\frac{1}{2}, \lim_{x \rightarrow 0} \frac{\sin(\ln(1+x) - x)}{\sin(\sin(x^2))} = -\frac{1}{2};$
- $\lim_{x \rightarrow 0} \frac{\ln(1+x) - x + \frac{x^2}{2}}{x^3} = \frac{1}{3}, \lim_{x \rightarrow 0} \frac{\ln(\ln(1+x) - x + \frac{x^2}{2} + 1)}{\ln(1+x^3)} = \frac{1}{3};$
- $\lim_{x \rightarrow \pi/2} \frac{\sin(\cos^2 x)}{\ln(\frac{2}{\pi}x)} = 0, \lim_{x \rightarrow \pi/2} \frac{\sin(\cos^2 x)}{\ln^2(\frac{2}{\pi}x)} = \frac{\pi^2}{4};$
- $\lim_{x \rightarrow \pi/2^-} \frac{\ln(\tan x)}{\ln x} = +\infty, \lim_{x \rightarrow \pi/2^-} \frac{\ln(\sin x)}{\cos x} = 0, \lim_{x \rightarrow \pi/2^-} \frac{\ln(\sin x)}{\cos^2 x} = -\frac{1}{2};$
- $\lim_{x \rightarrow +\infty} \frac{\ln(1 + \frac{1}{x}) - \frac{1}{x}}{\sin(\frac{1}{\ln x})} = 0, \lim_{x \rightarrow 1} \frac{\sin^3(\ln(x))}{\sin^2(\pi x)} = 0;$
- $\lim_{x \rightarrow +\infty} \frac{\ln(3 + \sin^2 x)}{x} = 0, \lim_{x \rightarrow +\infty} \frac{\sin(\ln(3 + \sin^2 x))}{x^{1/2}} = 0;$
- $\lim_{x \rightarrow +\infty} \frac{e^{1/\ln x} - 1}{e^{1/\ln(\ln x)} - 1} = 0.$