

**Sapienza Università di Roma - Facoltà I3S**  
**Corso di Laurea in Statistica Economia Finanza e Assicurazioni**  
**Corso di Laurea in Statistica Economia e Società**  
**Corso di Laurea in Statistica gestionale**  
**Matematica II corso - A.A. 2017-2018 – prof. Cigliola**  
**Foglio n.8 – Calcolo dei limiti**

**Esercizio 1.** Si calcolino i seguenti limiti:

- (i)  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} + \frac{1}{\sqrt{x}} \right)$  [ $+\infty$ ]
- (ii)  $\lim_{x \rightarrow 0} \left( \frac{1}{x} + x \right)$  [non esiste]
- (iii)  $\lim_{x \rightarrow 2} \left( \frac{\log x}{x} + \frac{1}{\sqrt{x}} \right)$
- (iv)  $\lim_{x \rightarrow 1} \left( \frac{x^3}{3} \right)$  [ $\frac{1}{3}$ ]
- (v)  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} + \frac{1}{\sqrt{x}} \right)$  [ $+\infty$ ]
- (vi)  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1}{(1 - 2 \cos x)^2}$  [ $+\infty$ ]
- (vii)  $\lim_{x \rightarrow 0^+} \left( \log_{\frac{1}{2}} x + \frac{1}{\sqrt{x}} \right)$  [ $+\infty$ ]
- (viii)  $\lim_{x \rightarrow 0^+} \left( \log_2 x + \frac{1}{\sqrt{x}} \right)$
- (ix)  $\lim_{x \rightarrow +\infty} (-3x^3 + 2x^4 - 5 + x)$  [ $+\infty$ ]
- (x)  $\lim_{x \rightarrow 1} \frac{x^2 - 6x + 5}{x^2 - 2x + 1}$  [non esiste]
- (xi)  $\lim_{x \rightarrow +\infty} \frac{x^2 - 6x + 5}{x^2 + 2x + 1}$  [1]
- (xii)  $\lim_{x \rightarrow -\infty} \frac{x^2 - 6x + 5}{4x^5 - 3x^4 + x^2 - 2x + 1}$  [0]
- (xiii)  $\lim_{x \rightarrow -\infty} \frac{-3x^4 + 5x^3 - 6x + 5}{x^2 - 7x + 7}$  [ $-\infty$ ]
- (xiv)  $\lim_{x \rightarrow +\infty} \log \frac{x}{x^2 + 1}$  [ $-\infty$ ]
- (xv)  $\lim_{x \rightarrow 0} e^{x + \sqrt{x^2 + 1} - \sqrt{x + 1}}$  [1]
- (xvi)  $\lim_{x \rightarrow +\infty} e^{x + \sqrt{x^2 + 1} - \sqrt{x + 1}}$
- (xvii)  $\lim_{x \rightarrow 0^+} \arctan \frac{\log x}{1 + \log x}$  [ $\frac{\pi}{4}$ ]
- (xviii)  $\lim_{x \rightarrow 0} e^{x + \sqrt{x^2 + 1} - \sqrt{x + 1}}$  [1]
- (xix)  $\lim_{x \rightarrow +\infty} \left( 1 + \frac{1}{x} \right)^{2x}$  [ $e^2$ ]
- (xx)  $\lim_{x \rightarrow -\infty} \left( 1 + \frac{1}{2x} \right)^x$  [ $\sqrt{e}$ ]

- (xxi)  $\lim_{x \rightarrow +\infty} \left(1 - \frac{3}{2x}\right)^x$  [  $e^{-\frac{3}{2}}$  ]
- (xxii)  $\lim_{x \rightarrow 0} (1 + 2x)^{\frac{1}{x}}$  [  $e^2$  ]
- (xxiii)  $\lim_{x \rightarrow 0} \frac{e^{2x} - 1}{x}$  [ 2 ]
- (xxiv)  $\lim_{x \rightarrow 0} \frac{\log_3(1+x)}{2x}$  [  $\frac{1}{2} \log_3 e$  ]
- (xxv)  $\lim_{x \rightarrow -2} \frac{e^{x+2} - 1}{x+2}$  [ 1 ]
- (xxvi)  $\lim_{x \rightarrow 0} \frac{2^{2x} - 1}{3^x - 1}$  [  $\frac{2 \log 2}{\log 3}$  ]
- (xxvii)  $\lim_{x \rightarrow 0} \frac{\sin \frac{x}{2}}{x}$  [  $\frac{1}{2}$  ]
- (xxviii)  $\lim_{x \rightarrow 0} \frac{\sin^2 x}{x}$  [ 0 ]
- (xxix)  $\lim_{x \rightarrow 0} \frac{\sin 2x}{x \cos x}$  [ 2 ]
- (xxx)  $\lim_{x \rightarrow 0} \frac{2x + 3 \sin x}{5x + \tan x}$  [  $\frac{5}{6}$  ]
- (xxxi)  $\lim_{x \rightarrow 0} \frac{3 \sin x + 4x \cos x}{2 \sin x - 3x \cos x}$  [ -7 ]
- (xxxii)  $\lim_{x \rightarrow 0} \frac{1 - \cos^3 x}{x \sin x}$  [  $\frac{3}{2}$  ]
- (xxxiii)  $\lim_{x \rightarrow 0} \frac{(x+1)^5 - 1}{2x}$  [  $\frac{5}{2}$  ]
- (xxxiv)  $\lim_{x \rightarrow 0} \frac{\sin 5x}{\sqrt[5]{x+1} - 1}$  [ 25 ]
- (xxxv)  $\lim_{x \rightarrow +\infty} \left(\frac{1}{x}\right)^{-\frac{1}{\log x+1}}$  [  $\frac{1}{2}$  ]
- (xxxvi)  $\lim_{x \rightarrow +\infty} \left(\frac{x-3}{|x|+4}\right)^{\frac{x^2-1}{2x}}$  [  $e^{-\frac{7}{2}}$  ]
- (xxxvii)  $\lim_{x \rightarrow 0^+} x^{\frac{2}{\log x}}$  [  $e^2$  ]
- (xxxviii)  $\lim_{x \rightarrow +\infty} (\sqrt{x+1} - \sqrt{x^2-4})$  [  $-\infty$  ]
- (xxxix)  $\lim_{x \rightarrow +\infty} \frac{2 \log^2 x + 3}{3 \log^2 x + \log x}$  [  $\frac{2}{3}$  ]
- (xli)  $\lim_{x \rightarrow 0} \left(\frac{x+1}{x+3}\right)^{\frac{x+1}{x}}$  [ non esiste ]
- (xli)  $\lim_{x \rightarrow +\infty} \left(\frac{x+1}{x+3}\right)^{\frac{x+1}{x}}$
- (xlii)  $\lim_{x \rightarrow 0} \left(\frac{1}{2x-x^2} - \frac{1}{x-5x^2}\right)$  [ non esiste ]
- (xliii)  $\lim_{x \rightarrow \frac{1}{5}} \frac{10x^2 - 13x - 3}{5x^2 - 9x - 2}$  [  $\frac{17}{11}$  ]
- (xliv)  $\lim_{x \rightarrow 2a} \frac{x^2 - ax - 2a^2}{x^2 - 4ax + 4a^2}$

[ se  $a \neq 0$ , si distinguono i casi  $x \rightarrow a^+$  e  $x \rightarrow a^-$ , se  $a = 0$ ... ]