Applicando il primo teorema di De L'Hospital calcolare i seguenti limiti che si presentano nella forma indeterminata $\frac{0}{0}$

174 $\lim_{x\to 1} \frac{x^3-1}{x^2-1}$

175 $\lim_{x\to 4} \frac{\sqrt{x}-2}{x-4}$

176 $\lim_{x\to -2} \frac{x+2}{\sqrt{x^2+2x}}$

177 $\lim_{x\to 1} \frac{\ln(2-x)}{2-\sqrt{x^2+3}}$

178 $\lim_{x\to 0} \frac{x+\sin x}{x-\sqrt{x}}$

179 $\lim_{x\to 0} \frac{x-\sin x}{x+\sin x}$

$\frac{3}{2}$, $\frac{1}{4}$, 0 , 2 , 0 , 0

180 $\lim_{x\to 0^+} \frac{1-e^x}{x^2}$

181 $\lim_{x\to \frac{\pi}{2}} \frac{x\cos x}{x-\frac{\pi}{2}}$

182 $\lim_{x\to +\infty} \frac{\sin\frac{1}{x}}{1-e^{\frac{1}{x}}}$

183 $\lim_{x\to 0} \frac{2x^2-3x^3}{(e^x-1)^2}$

184 $\lim_{x\to 5} \frac{2\ln x-\ln 25}{x^2-25}$

185 $\lim_{x\to 3} \frac{2^x-8}{x^2-9}$

$-\infty$, $-\frac{\pi}{2}$, -1 , 2 , $\frac{1}{25}$, $\frac{4}{3}\ln 2$

186 $\lim_{x\to 1} \frac{x\cdot 2^x-2x}{\ln x}$

187 $\lim_{x\to 0} \frac{e^x-1-x}{x^2}$

188 $\lim_{x\to 0} \frac{x-2\tan x}{x}$

189 $\lim_{x\to 0} \frac{3(e^x-1)}{\ln(x+1)}$

190 $\lim_{x\to 1} \frac{x^2-1}{e^x\ln x}$

191 $\lim_{x\to 3} \frac{\sqrt{x}-\sqrt{3}}{x^2-3x}$

$2\ln 2$, $\frac{1}{2}$, -1 , 3 , $\frac{2}{e}$, $\frac{\sqrt{3}}{18}$

192 $\lim_{x\to \frac{\pi}{4}} \frac{\sin x-\cos x}{\tan x-1}$

193 $\lim_{x\to 0} \frac{\sin x-x}{\cos x-1}$

194 $\lim_{x\to 0} \frac{(2x-1)^5+1}{x}$

195 $\lim_{x\to 0} \frac{3x^2-4x+\sin 2x}{x^2-1+\cos x}$

196 $\lim_{x\to 2} \frac{\sqrt{x}-\sqrt{2}}{x^2-x-2}$

197 $\lim_{x\to +\infty} \frac{e^{\frac{1}{x}}-1}{\pi-2\arctan x}$

$\frac{\sqrt{2}}{2}$,0,10, ∞ , $\frac{\sqrt{2}}{12}$, $\frac{1}{2}$

198 $\lim_{x\to \sqrt{2}} \frac{x^3-2\sqrt{2}x^2+2x}{x^2-(\sqrt{2}+\sqrt{6})x+2\sqrt{3}}$

199 $\lim_{x\to 2^+} \frac{\sqrt{x-2}+\sqrt{x-1}-1}{x^2-4}$

200 $\lim_{x\to 6} \frac{2-\sqrt{x-2}}{x^2-5x-6}$

201 $\lim_{x\to 0} \frac{e^{2x}-5x-1}{\sin^2 x-x}$

0 , $+\infty$, $-\frac{1}{28}$,3

202 $\lim_{x\to 0} \frac{\sin 3x-\sin\frac{x}{2}}{x^2-3x}$

203 $\lim_{x\to 1} \frac{\ln^2 x-3\ln x}{\sin(x-1)}$

204 $\lim_{x\to 0} \sqrt{\frac{1-\cos x}{2x}}$

$-\frac{5}{6}$, -3 , 0

572. $\lim_{x\to 0} \frac{1-\cos x}{x}$. R. 0

573. $\lim_{x\to 0} \frac{\sqrt{1-\cos x}}{x}$ R. $\frac{\sqrt{2}}{2}$

574. $\lim_{x\to 0} \frac{\operatorname{tg} x}{1-\cos x}$. R. ∞

575. $\lim_{x\to 0} \frac{\operatorname{sen} x-x\cos x}{x\cos x}$. R. 0

576. $\lim_{x\to 0} \frac{1-\cos^2 x}{x\operatorname{sen} x\cos x}$. R. 1

577. $\lim_{x\to 0} \frac{x\operatorname{sen} x}{1+\cos x-2\cos^2 x}$ R. $\frac{2}{3}$

578. $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\operatorname{sen} x + \cos 2x}{1 + \operatorname{sen}^2 2x + \cos 2x}$ R. $\dfrac{1}{4}$

579. $\lim\limits_{x \to a} \dfrac{\operatorname{tg}(x - a)}{\operatorname{sen}^2 x - \operatorname{sen}^2 a}$ R. $\dfrac{1}{\operatorname{sen} 2a}$

580. $\lim\limits_{x \to \frac{\pi}{4}} \dfrac{\cos 2x}{\cos x - \cos \frac{\pi}{4}}$.   R. $2\sqrt{2}$

581. $\lim\limits_{x \to \pi} \dfrac{(x - \pi)^2}{3\left(\operatorname{sen}^2 \frac{x}{2} + \cos x\right)}$.   R. $\dfrac{4}{3}$

582. $\lim\limits_{x \to 0} \dfrac{\operatorname{tg} x - \operatorname{sen} x}{x^3}$.   R. $\dfrac{1}{2}$

583. $\lim\limits_{x \to 0} \dfrac{1 + 2\cos^3 x - 3\sqrt{\cos 2x}}{\operatorname{sen}^4 x}$ R. $\dfrac{9}{4}$

584. $\lim\limits_{x \to 0} \dfrac{x + \operatorname{arc\,tg} x}{\operatorname{arc\,sen} x}$.   R. 2

585. $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x} - 2\operatorname{sen} x}{x - \operatorname{sen} x}$ R. 4

586. $\lim\limits_{x \to 0} \dfrac{\log(1 + 2x)}{x}$.   R. 2

587. $\lim\limits_{x \to 0} \dfrac{e^x - 1}{x}$.   R. 1

573. $\lim\limits_{x \to 0} \dfrac{\sqrt{1 - \cos x}}{x}$.   R. $\dfrac{\sqrt{2}}{2}$

574. $\lim\limits_{x \to 0} \dfrac{\operatorname{tg} x}{1 - \cos x}$.   R. ∞

575. $\lim\limits_{x \to 0} \dfrac{\operatorname{sen} x - x\cos x}{x\cos x}$ R. 0

576. $\lim\limits_{x \to 0} \dfrac{1 - \cos^2 x}{x \operatorname{sen} x \cos x}$.   R. 1

577. $\lim\limits_{x \to 0} \dfrac{x \operatorname{sen} x}{1 + \cos x - 2\cos^2 x}$ R. $\dfrac{2}{3}$

578. $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\operatorname{sen} x + \cos 2x}{1 + \operatorname{sen}^2 2x + \cos 2x}$ R. $\dfrac{1}{4}$

579. $\lim\limits_{x \to a} \dfrac{\operatorname{tg}(x - a)}{\operatorname{sen}^2 x - \operatorname{sen}^2 a}$ R. $\dfrac{1}{\operatorname{sen} 2a}$

580. $\lim\limits_{x \to \frac{\pi}{4}} \dfrac{\cos 2x}{\cos x - \cos \frac{\pi}{4}}$.   R. $2\sqrt{2}$

581. $\lim\limits_{x \to \pi} \dfrac{(x - \pi)^2}{3\left(\operatorname{sen}^2 \frac{x}{2} + \cos x\right)}$.   R. $\dfrac{4}{3}$

582. $\lim\limits_{x \to 0} \dfrac{\operatorname{tg} x - \operatorname{sen} x}{x^3}$.   R. $\dfrac{1}{2}$

583. $\lim\limits_{x \to 0} \dfrac{1 + 2\cos^3 x - 3\sqrt{\cos 2x}}{\operatorname{sen}^4 x}$ R. $\dfrac{9}{4}$

584. $\lim\limits_{x \to 0} \dfrac{x + \operatorname{arc\,tg} x}{\operatorname{arc\,sen} x}$.   R. 2

585. $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x} - 2\operatorname{sen} x}{x - \operatorname{sen} x}$ R. 4

586. $\lim\limits_{x \to 0} \dfrac{\log(1 + 2x)}{x}$.   R. 2

587. $\lim\limits_{x \to 0} \dfrac{e^x - 1}{x}$.   R. 1

588. $\lim\limits_{x \to 0} \dfrac{x^2 - \operatorname{sen}^2 x}{e^x - e^{-x} - 2\operatorname{sen} x}$ R. 0

590. $\lim\limits_{x \to 0} \dfrac{e^{x^2} - 1}{1 - \cos x}$ R. 2

591. $\lim\limits_{x \to 0} \dfrac{e^{\operatorname{sen} x} - 1}{\operatorname{tg} x}$ R. 1

Applicando il primo teorema di De L'Hospital calcolare i seguenti limiti che si presentano nella forma indeterminata $\frac{\infty}{\infty}$

205 $\lim_{x\to+\infty} \frac{x^3-2x}{\ln x}$ $+\infty$	**206** $\lim_{x\to 0^+} \frac{e^{\frac{1}{x}}-1}{\ln x}$ $-\infty$	**207** $\lim_{x\to\infty} \frac{e^x+x}{e^x-1}$ **1**
208 $\lim_{x\to\left(\frac{\pi}{2}\right)^-} \frac{\ln(\cos x)}{\tan x}$ **0**	**209** $\lim_{x\to+\infty} \frac{\sqrt[3]{x}+1}{\ln(1+x^2)}$ $+\infty$	**210** $\lim_{x\to-\infty} \frac{\ln(1-x)}{x}$ **0**
211 $\lim_{x\to+\infty} \frac{x-\sqrt{x-1}}{x+\sqrt{x+1}}$ **1**	**212** $\lim_{x\to+\infty} \frac{e^{x^2}}{e^x+x^2}$ $+\infty$	**213** $\lim_{x\to+\infty} \frac{x^3+2x^2+1}{e^{2x}}$ **0**
214 $\lim_{x\to\infty} \frac{\ln(1+x^2)}{x}$ **0**	**215** $\lim_{x\to-1^+} \frac{e^{\frac{1}{x+1}}}{\ln(1+x)}$ $-\infty$	**216** $\lim_{x\to+\infty} \frac{x^2-3\sin x}{2x^3+3\cos x}$ **0**
217 $\lim_{x\to 0^+} \frac{\ln x}{e^{\frac{1}{x}}}$ **0**	**218** $\lim_{x\to 2^+} \frac{\tan\left(x\cdot\frac{\pi}{4}\right)}{\ln(x-2)+x^2}$ $+\infty$	**219** $\lim_{x\to+\infty} \frac{\ln^2 x-\ln x}{x^2-x}$ **0**
220 $\lim_{x\to+\infty} \frac{e^x-x}{x^3}$ $+\infty$	**221** $\lim_{x\to+\infty} \frac{3x^2-7\sqrt{x}+1}{\sqrt{x-2}+x^3}$ **0**	**222** $\lim_{x\to\left(\frac{\pi}{2}\right)^-} \frac{\ln(\tan x)}{\tan x}$ **0**
223 $\lim_{x\to+\infty} \frac{e^x}{\ln x-x}$ $-\infty$	**224** $\lim_{x\to+\infty} \frac{e^x}{x\ln x}$ $+\infty$	**225** $\lim_{x\to+\infty} \frac{\sqrt{2x-3}+5x}{\sqrt[3]{x^3-1}}$ **5**
226 $\lim_{x\to 0^+} \frac{\ln x}{\cotan x}$ **0**		
136 $\lim_{x\to+\infty} \frac{x+x^2}{e^x}=0;$ **137** $\lim_{x\to-\infty} \frac{2^{-x}}{x^2}=+\infty;$ **138** $\lim_{x\to+\infty} \frac{3^x+x}{3^x-x}=1;$ **139** $\lim_{x\to+\infty} \frac{(\lg x)^2}{\sqrt{x}}=0;$	$\lim_{x\to+\infty} \frac{e^x}{\lg(x^4)}=+\infty;$ $\lim_{x\to 0^+} \frac{\lg \operatorname{sen} x}{1/x}=0;$ $\lim_{x\to+\infty} \frac{x+2\lg x}{2x+\lg x}=\frac{1}{2};$ $\lim_{x\to 0^+} \frac{\operatorname{cotang} x}{\lg(x^3)}=-\infty;$	**140** $\lim_{x\to(\pi/2)^+} \frac{\lg[x-(\pi/2)]}{\operatorname{tang} x}=0;$ **141** $\lim_{x\to 3^+} \frac{\lg(x-3)}{(x-3)^{-1}}=0;$ **142** $\lim_{x\to+\infty} \frac{2\sqrt{e^x}}{x^2}=+\infty;$ **143** $\lim_{x\to\pi/2} \frac{x^2\operatorname{tang} x}{1+2\operatorname{tang} x}=\frac{\pi^2}{8};$
$\lim_{x\to+\infty} \frac{\lg(5+2x)}{x}=0;$ $\lim_{x\to 0^+} \frac{\lg x}{e^{1/x}}=0;$ $\lim_{x\to\pi} \frac{\lg(x-\pi)}{\operatorname{cotang} 2x}=0;$ $\lim_{x\to 0^+} \frac{\lg x}{x^{-5}}=0.$		

Applicando i teoremi di De L'Hospital calcolare i seguenti limiti che si presentano nelle altre forme indeterminate

227 $\lim_{x\to1^-}(x-1)\cdot\ln(1-x)$ **0**	**228** $\lim_{x\to+\infty} e^{-3x+2}\cdot(x^4-5x+1)$ **0**	**229** $\lim_{x\to-\infty} e^{4x-1}\cdot(x^3+x-2)$ **0**
230 $\lim_{x\to\frac{\pi}{2}}\left(x-\frac{\pi}{2}\right)\cdot\tan x$ **-1**	**231** $\lim_{x\to-\infty} x^5\cdot e^x$ **0**	**232** $\lim_{x\to0^+}(x+\sin x)\cdot\ln x$ **0**
233 $\lim_{x\to+\infty}(\ln x-x^2)$ $-\infty$	**234** $\lim_{x\to0^+}\left(\ln x+\frac{1}{x^3}\right)$ $+\infty$	**235** $\lim_{x\to+\infty}(e^x-x)$ $+\infty$
237 $\lim_{x\to+\infty}\frac{e^{2x}}{e^x-x^2}$ $+\infty$	**238** $\lim_{x\to0} x^{\sin x}$ **1**	**239** $\lim_{x\to+\infty}\left(\frac{1}{x}\right)^{\frac{2}{x}}$ **1**
240 $\lim_{x\to0^+}(x^2+2x)^{2x}$ **1**	**241** $\lim_{x\to\frac{\pi}{2}}\left(\frac{\pi}{2}-x\right)^{\cos x}$ **1**	**242** $\lim_{x\to0}(1-e^x)^x$ **1**
243 $\lim_{x\to0}(\tan x)^x$ **1**	**244** $\lim_{x\to0^+}(1+x)^{\ln x}$ **1**	
245 $\lim_{x\to+\infty}\left(1+\frac{2}{x}\right)^{x^2}$ **246** $\lim_{x\to\frac{\pi}{2}}(\sin x)^{\tan x}$ **247** $\lim_{x\to+\infty}\left(\frac{x^2+1}{x^2}\right)^x$ **248** $\lim_{x\to0}(\cos x)^{\frac{1}{x}}$ **249** $\lim_{x\to+\infty}(1+2x)^{\frac{1}{x}}$ $+\infty$ **, 1 , 1 1 , 1**	**250** $\lim_{x\to+\infty}(x^3+x)e^{-x}$ **251** $\lim_{x\to1^+}\left(\frac{1}{x-1}\right)^{\sqrt{x-1}}$ **252** $\lim_{x\to0^+}\left(\frac{1}{x}\right)^{\sin x}$ **253** $\lim_{x\to\left(\frac{\pi}{2}\right)^-}(\tan x)^{\cos x}$ **254** $\lim_{x\to0}\left(\frac{1}{x}\right)^{\sqrt{x}}$ **0 , 1 , 1 , 1 , 1**	**255** $\lim_{x\to0}\left(\frac{1}{x}\right)^{x^2}$ **256** $\lim_{x\to0}\frac{1}{5}(3x-3\sin x)x^{-3}$ **257** $\lim_{x\to0}(1+\sin x)^{\text{cotan } x}$ **258** $\lim_{x\to0}(x\cdot\text{cotan } x)^{\frac{1}{\sin x}}$ **259** $\lim_{x\to0}\frac{e^x-e^{-x}}{x-\sin x}$ **1 ,** $\frac{1}{10}$ **,e , 1 ,** ∞
260 $\lim_{x\to+\infty}\left(\frac{\sqrt{1+x}}{\ln x}\right)\cdot\frac{1}{e^x}$ **261** $\lim_{x\to\frac{\pi}{2}}\left(\frac{1}{\cos x}-\tan x\right)$ **0 , 0**	**263** $\lim_{x\to+\infty}\left(\frac{1}{x}\right)^{\frac{1}{e^{2x+1}}}$ **264** $\lim_{x\to e}\left(\frac{1}{\ln x}-1\right)^{x-e}$ **1 , 1**	**265** $\lim_{x\to0}\frac{\ln(x+1)}{1-e^{x^2}}$ **266** $\lim_{x\to0^+}\frac{\sqrt{1-\ln x}}{e^{\frac{1}{x}}}$ ∞ **, 0**
267 $\lim_{x\to0}\sqrt[x]{1+x^4}$ **268** $\lim_{x\to0}(1+x)^{\tan\left(\frac{\pi}{2}+x\right)}$ **1 ,** $\frac{1}{e}$		

Applicando i teoremi di De L'Hospital calcolare i seguenti limiti

23. $\lim\limits_{x\to 0} \dfrac{1-\cos x + 2x \operatorname{sen} x}{\operatorname{sen} x + x \cos x}$ **R.** 0

24. $\lim\limits_{x\to 0} \dfrac{\operatorname{sen} x}{\operatorname{sen} x + x \cos x}$ **R.** $\dfrac{1}{2}$

25. $\lim\limits_{x\to 0} \dfrac{\operatorname{sen} x}{\operatorname{sen} x + x \cos x - x^2 \operatorname{sen} x}$ **R.** $\dfrac{1}{2}$

26. $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\pi - 2x}{\cos x}$ **R.** 2

27. $\lim\limits_{x\to \frac{\pi}{4}} \dfrac{\operatorname{sen} x - \cos x}{\operatorname{sen} 2x - 2\cos^2 x}$ **R.** $\dfrac{\sqrt{2}}{2}$

28. $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\operatorname{ctg} x + \operatorname{cosec} x - 1}{\operatorname{ctg} x - \operatorname{cosec} x + 1}$ **R.** 1

29. $\lim\limits_{x\to 0} \dfrac{\operatorname{tg} x - \operatorname{sen} x}{\operatorname{sen}^3 x}$ **R.** $\dfrac{1}{2}$

30. $\lim\limits_{x\to 0} \dfrac{\operatorname{sen} x - x\cos x}{x^2 \operatorname{sen} x}$ **R.** $\dfrac{1}{3}$

31. $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{1-\operatorname{sen} x}{\operatorname{ctg} x}$ **R.** 0

32. $\lim\limits_{x\to 0} \dfrac{1+\operatorname{sen} x - \cos x}{1+\operatorname{sen} 3x - \cos 3x}$ **R.** $\dfrac{1}{3}$

33. $\lim\limits_{x\to 0} \dfrac{x - \operatorname{sen} x}{x^3}$ **R.** $\dfrac{1}{6}$

34. $\lim\limits_{x\to 0} \dfrac{\operatorname{tg} x - x}{x^3}$ **R.** $\dfrac{1}{3}$

35. $\lim\limits_{x\to 0} \dfrac{x^2 - 2 + 2\cos x}{x^2 - x^2\cos x}$ **R.** $\dfrac{1}{6}$

36. $\lim\limits_{x\to 0} \dfrac{1-\cos x\sqrt{\cos 2x}}{\operatorname{sen}^2 x}$ **R.** $\dfrac{3}{2}$

37. $\lim\limits_{x\to 0} \dfrac{2\operatorname{tg} x \cos^2 x}{\operatorname{tg} 2x \cos^2 2x}$ **R.** 1

38. $\lim\limits_{x\to \frac{\pi}{6}} \dfrac{2\operatorname{sen} x - \operatorname{sen} 3x}{\sqrt{3}\cos x - 3\operatorname{sen} x}$ **R.** $-\dfrac{1}{2}$

39. $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\sqrt{2-\operatorname{sen} x} + \cos 2x}{\sqrt{1+\cos^2 2x} - 2\operatorname{sen}\dfrac{x}{2}}$ **R.** 0

40. $\lim\limits_{x\to 0} \dfrac{x - \operatorname{arcsen} x}{x^3}$ **R.** $-\dfrac{1}{6}$

41. $\lim\limits_{x\to 0} \dfrac{x - \operatorname{arctg} x}{\operatorname{arcsen} x}$ **R.** 0

42. $\lim\limits_{x\to 0} \dfrac{\operatorname{arcsen} 2x - x}{2\arccos x - \pi}$ **R.** $-\dfrac{1}{2}$

43. $\lim\limits_{x\to 0} \dfrac{\ln(x+1)}{2-\ln[(x+e)^2]}$ **R.** $-\dfrac{e}{2}$

44. $\lim\limits_{x\to 0} \dfrac{\operatorname{tg} x}{\ln(1+x)}$ **R.** 1

45. $\lim\limits_{x\to \frac{\pi}{4}} \dfrac{\ln \operatorname{tg} x}{\operatorname{ctg} 2x}$ **R.** -1

46. $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\ln\left(2-\dfrac{2x}{\pi}\right)}{\operatorname{ctg} x}$ **R.** $\dfrac{2}{\pi}$

47. $\lim\limits_{x\to 0} \dfrac{1-\cos x - \ln\cos x}{x^2}$ **R.** 1

48. $\lim\limits_{x\to 0} \dfrac{\ln(1+x^2)}{x\operatorname{sen} x}$ **R.** 1

49. $\lim\limits_{x\to 1} \dfrac{2^{\ln x} - x}{\ln x}$ **R.** $\ln 2 - 1$

50. $\lim\limits_{x\to 0} \dfrac{a^x - x\ln a - \cos x}{\operatorname{sen}^2 x}$ **R.** $\dfrac{1}{2}(\ln^2 a + 1)$

51. $\lim\limits_{x\to 0}\dfrac{e^x+\ln(1-x)-1}{\operatorname{tg}x-x}$ **R.** $-\dfrac{1}{2}$ **52.** $\lim\limits_{x\to 0^+}\dfrac{e^x-\cos x}{\operatorname{sen}^2 x}$ **R.** $+\infty$	**53.** $\lim\limits_{x\to 0}\dfrac{e^{2x}-1}{x(e^{2x}+1)}$ **R.** 1 **54.** $\lim\limits_{x\to 0}\dfrac{e^{x^2}-1}{1-\cos x}$ **R.** 2
55. $\lim\limits_{x\to 0}\dfrac{e^{2x}-1-2x}{1-\cos x}$ **R.** 4 **56.** $\lim\limits_{x\to 0^+} x^3\operatorname{ctg}x$ **R.** 0 **57.** $\lim\limits_{x\to 0^+}\dfrac{\ln\operatorname{sen}x}{\operatorname{ctg}x}$ **R.** 0 **58.** $\lim\limits_{x\to\left(\frac{\pi}{2}\right)^-}\dfrac{\ln(1-\operatorname{sen}x)}{\ln\cos x}$ **R.** 2	**59.** $\lim\limits_{x\to\left(\frac{\pi}{2}\right)^-}\dfrac{\operatorname{tg}x}{\ln\left(\dfrac{\pi}{2}-x\right)}$ **R.** $-\infty$ **60.** $\lim\limits_{x\to 0^+}\dfrac{\ln\operatorname{tg}3x}{\ln\operatorname{tg}x}$ **R.** 1 **61.** $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{\operatorname{tg}x}{\operatorname{tg}3x}$ **R.** 3 **62.** $\lim\limits_{x\to 0}\dfrac{x-\operatorname{sen}x}{x^2\operatorname{sen}x}$ **R.** $\dfrac{1}{6}$
63. $\lim\limits_{x\to+\infty}\dfrac{\ln x}{x^3}$ **R.** 0 **64.** $\lim\limits_{x\to+\infty}\dfrac{e^x}{x^2}$ **R.** $+\infty$ **65.** $\lim\limits_{x\to+\infty}\dfrac{2x+\sqrt{x+1}}{3x+\sqrt{2x-1}}$ **R.** $\dfrac{2}{3}$ **66.** $\lim\limits_{x\to+\infty}\dfrac{e^x+e^{2x}}{2e^x+x}$ **R.** $+\infty$ **67.** $\lim\limits_{x\to+\infty}\dfrac{\ln(x^2+3x)}{\ln x}$ **R.** 2	**68.** $\lim\limits_{x\to 0^+}(x\cdot\ln x)$ **R.** 0 **69.** $\lim\limits_{x\to 0^+}\left(x^2\cdot e^{\frac{1}{x}}\right)$ **R.** $+\infty$ **70.** $\lim\limits_{x\to\left(\frac{\pi}{2}\right)^-}(\cos x\cdot\ln\cos x)$ **R.** 0 **71.** $\lim\limits_{x\to 2^+}\left[(x-2)\,e^{\frac{1+x}{x-2}}\right]$ **R.** $+\infty$
72. $\lim\limits_{x\to 0^+}(\operatorname{tg}x\cdot\ln x)$ **R.** 0 **73.** $\lim\limits_{x\to\frac{\pi}{2}}[(1-\operatorname{sen}x)\operatorname{tg}x]$ **R.** 0 **74.** $\lim\limits_{x\to 0}[(1-\cos x)\operatorname{ctg}x]$ **R.** 0 **75.** $\lim\limits_{x\to -1}\dfrac{x^2-\ln^2(2+x)+2x+1}{(x+1)^2}$ **R.** 0 **76.** $\lim\limits_{x\to-\infty}(x\cdot e^x)$ **R.** 0 **77.** $\lim\limits_{x\to 4}\left[(4-x)\cdot\operatorname{tg}\dfrac{\pi}{8}x-1\right]$ $\dfrac{8-\pi}{\pi}$	**78.** $\lim\limits_{x\to 0}\dfrac{\operatorname{sen}x}{\cos x-e^x}$ -1 **79.** $\lim\limits_{x\to\pi}\dfrac{\ln\operatorname{tg}\dfrac{x}{4}}{x-\pi}$ $\dfrac{1}{2}$ **80.** $\lim\limits_{x\to 0}\left[\dfrac{1}{x}-\dfrac{1}{\ln(x+1)}\right]$ $-\dfrac{1}{2}$ **81.** $\lim\limits_{x\to 0}\left(\operatorname{cosec}x-\dfrac{1}{e^x-1}\right)$ $\dfrac{1}{2}$ **82.** $\lim\limits_{x\to 0}\left(\dfrac{1}{x\cdot\cos x}-\operatorname{cotg}x\right)$ 0 **83.** $\lim\limits_{x\to 0}\left[\dfrac{1}{x(e^x+1)}-\dfrac{1}{2x}\right]$ $-\dfrac{1}{4}$

Stabilire se le seguenti funzioni verificano le ipotesi del teorema di Rolle ed in caso affermativo calcolare le ascisse dei punti di Rolle

4 $f(x) = x^3 - 3x$ in $[-2, 1]$ $[x = -1]$

5 $f(x) = x^3 - 7x$ in $[1, 2]$ $\left[x = \frac{\sqrt{21}}{3}\right]$

6 $f(x) = 1 + |x|$ in $[-1, 1]$ [non è derivabile in $x = 0$]

7 $f(x) = x^3 - 4x^2 - x + 5$ in $[-1, 1]$ $\left[x = \frac{4 - \sqrt{19}}{3}\right]$

8 $f(x) = x^3 - 3x^2 + 2x$ in $[0, 1]$ $\left[x = \frac{3 - \sqrt{3}}{3}\right]$

9 $f(x) = x^4 - 5x^3 - 8x^2 + 60x - 48$ in $[1, 4]$ $\left[x = 2,\ x = \frac{15}{4}\right]$

10 $f(x) = x^3 - 9x^2$ in $[0, 9]$ $[x = 6]$

12 $f(x) = x^4 - 10x^2 + 9$ in $[-3, 3]$ $[x = 0,\ x = \pm\sqrt{5}]$

13 $f(x) = \sqrt{1 - x^2}$ in $[-1, 1]$ $[x = 0]$

14 $f(x) = \frac{1}{x^2 + 1}$ in $[-1, 1]$ $[x = 0]$

15 $f(x) = \frac{x}{x^2 + 4}$ in $[1, 4]$ $[x = 2]$

16 $f(x) = \sqrt[5]{|x + 3|}$ in $[-6, 0]$ [non è derivabile in $x = -3$]

17 $f(x) = \frac{3x + 1}{3x^2}$ in $\left[-1, -\frac{1}{2}\right]$ $\left[x = -\frac{2}{3}\right]$

18 $f(x) = -\frac{9x^2 - 3x - 1}{x^2}$ in $\left[-1, -\frac{1}{2}\right]$ $\left[x = -\frac{2}{3}\right]$

19 $f(x) = \frac{3x - 5}{(x - 2)^2}$ in $\left[1, \frac{3}{2}\right]$ $x = \frac{4}{3}$

20 $f(x) = \frac{x^2 + x}{x^2 + 1}$ in $[-1, 0]$ $[x = 1 - \sqrt{2}]$

21 $f(x) = \frac{x^2 - 6x}{x^2 + 1}$ in $\left[-\frac{7}{5},\ -1\right]$ $\left[x = \frac{-1 - \sqrt{37}}{6}\right]$

22 $f(x) = \frac{2x^2 - 1}{x + 1}$ in $\left[-\frac{7}{8}, 3\right]$ $\left[x = \frac{\sqrt{2}}{2} - 1\right]$

23 $f(x) = \sqrt[5]{|x| + 3}$ in $[-3, 3]$ [non è derivabile in $x = 0$]

24 $f(x) = \sqrt{x + 1} - 2\sqrt{x + 2}$ in $\left[-1,\ \frac{7}{9}\right]$ $\left[x = -\frac{2}{3}\right]$

25 $f(x) = \sqrt{1 - x^2 + x^4}$ in $\left[-\frac{1}{2}, \frac{1}{2}\right]$ $[x = 0]$

26 $f(x) = x\sqrt{1 + x}$ in $[-1, 0]$ $\left[x = -\frac{2}{3}\right]$

27 $f(x) = \begin{cases} -3x + 6 & x < 3 \\ x^2 - 6x + 11 & x \geq 3 \end{cases}$ in $[2, 4]$ [non è continua in $x = 3$]

28 $f(x) = x^2 \cdot \sqrt{1 - x^2}$ in $[-1, 1]$ $\left[x = 0,\ x = \pm\frac{\sqrt{6}}{3}\right]$

29 $f(x) = x \cdot \sqrt{1 - x^2}$ in $[0, 1]$ $\left[x = \frac{\sqrt{2}}{2}\right]$

30 $f(x) = \dfrac{x^2 - 3x + 5}{x + 1}$ in $[0, 2]$ $[f(0) \neq f(2)]$

31 $f(x) = \sin x - \cos^2 x$ in $[0, \pi]$ $\left[x = \frac{\pi}{2}\right]$

32 $f(x) = \sin 2x$ in $\left[\frac{\pi}{2}, \pi\right]$ $\left[x = \frac{3}{4}\pi\right]$

33 $f(x) = \tan x(1 + \tan x)$ in $\left[-\frac{\pi}{4}, 0\right]$ $\left[x = -\arctan\frac{1}{2}\right]$

34 $f(x) = \ln(x^2 + 1)$ in $[-1, 1]$ $[x = 0]$

35 $f(x) = \dfrac{x^2 - 3x + 5}{x - 1}$ in $[0, 2]$ [non è definita in $x = 1$]

36 $f(x) = \ln^2 x - \ln x$ in $[1, e]$ $[x = \sqrt{e}]$

37 $f(x) = \dfrac{\ln x + 1}{\ln x}$ in $\left[e^{-\frac{1}{2}}, e\right]$ [non è definita in $x = 1$]

38 $f(x) = e^{-x} + e^x$ in $[-1, 1]$ $[x = 0]$

8. $y = \dfrac{x^3 + 2}{x}$ $[\sqrt{2} - 1\ ;\ 2]$ **R.** $x = 1$

9. $y = \dfrac{x^2 - 1}{x^2 + 1}$ $[-\sqrt{3}\ ;\ \sqrt{3}]$ **R.** $x = 0$

10. $y = \sqrt{x^3 - 12x}$ $]-2\sqrt{3}\ ;\ 0[$ **R.** $x = -2$

11. $y = \dfrac{1}{\sqrt{1 - x^2}}$ $\left[-\frac{\sqrt{2}}{2}\ ;\ \frac{\sqrt{2}}{2}\right]$ **R.** $x = 0$

12. $y = \text{sen}\, x + \cos x$ $\left[0\ ;\ \frac{\pi}{2}\right]$ **R.** $x = \frac{\pi}{4}$

13. $y = \cos x + \frac{1}{2}\text{sen}\, 2x$ $[0\ ;\ 2\pi]$ **R.** $x = \frac{\pi}{6}$, $x = \frac{5}{6}\pi$, $x = \frac{3}{2}\pi$

Per quali valori del parametro a le seguenti funzioni verificano le ipotesi del teorema di Rolle e per tali valori calcolare i punti di Rolle

40 $f(x)=\begin{cases} x+a & x\le 0 \\ -x^2+ax+a & x>0 \end{cases}$ nell'intervallo $\left[-1, \frac{1+\sqrt{5}}{2}\right]$ $\left[a=1,\ x=\frac{1}{2}\right]$

41 $f(x)=\begin{cases} x^2 & x\le 0 \\ ax^3 & x>0 \end{cases}$ nell'intervallo $[-2,\ 1]$ $[a=4,\ x=0]$

42 $f(x)=\begin{cases} x^2+2x & x\le 0 \\ ax & x>0 \end{cases}$ nell'intervallo $\left[-3, \frac{3}{2}\right]$ $[a=2,\ x=-1]$

43 $f(x)=\begin{cases} x^2-a & x<0 \\ 1-3x-x^2 & x\ge 0 \end{cases}$ nell'intervallo $[-2, 1]$ $[\nexists a]$

44 $f(x)=\begin{cases} (x-a)^2 & x<1 \\ \ln^2 x & x\ge 1 \end{cases}$ nell'intervallo $[0, e]$ $[a=1,\ x=1]$

45 $f(x)=\begin{cases} x^2+3x & x<0 \\ a\sin x & x\ge 0 \end{cases}$ nell'intervallo $[-3, \pi]$ $\left[a=3,\ x=-\frac{3}{2},\ x=\frac{\pi}{2}\right]$

46 $f(x)=\begin{cases} x^3-x^2 & x\le 1 \\ a\,(x^2-3x+2) & x>1 \end{cases}$ nell'intervallo $[0, 2]$ $\left[a=-1,\ x=0,\ x=\frac{2}{3},\ x=\frac{3}{2}\right]$

47 $f(x)=\begin{cases} 2x+1 & x\le 0 \\ -x^2+ax+1 & x>0 \end{cases}$ nell'intervallo $[0, 6]$ $[a=6,\ x=3]$

48 $f(x)=\begin{cases} y=\cos x & x\le 0 \\ y=a-x^2 & x>0 \end{cases}$ nell'intervallo $\left[-\frac{3}{2}\pi, 1\right]$ $[a=1,\ x=0,\ x=-\pi]$

49 $f(x)=\begin{cases} y=-x^2+ax & x\ge 0 \\ y=e^x-1 & x<0 \end{cases}$ nell'intervallo $\left[\ln\frac{3}{4}, \frac{\sqrt{2}+1}{2}\right]$ $\left[a=1,\ x=\frac{1}{2}\right]$

Stabilire se le seguenti funzioni verificano le ipotesi del teorema di Lagrange ed in caso affermativo calcolare le ascisse dei punti di Lagrange

51 $f(x)=x^2-2x+4$ in $[-1, 1]$ $[x=0]$

52 $f(x)=4x^2+3x-1$ in $[1, 3]$ $[x=2]$

54 $f(x)=x^3+2x$ in $[-1, 2]$ $[x=1]$

55 $f(x)=\sqrt{x}$ in $[0, 4]$ $[x=1]$

56 $f(x)=\frac{1}{x}$ in $[-1, 1]$ [non è definita in $x=0$]

6. $y=\dfrac{x^2-x+4}{x-1}$ $\left[\frac{3}{2}\ ;\ 3\right]$ **R.** $x=2$

57 $f(x) = 3x^4 - 5x^3 + 3x$ in $[0, 3]$ $[x = 2]$

58 $f(x) = \dfrac{17x - 6}{x^2}$ in $[1, 2]$ $\left[x = \dfrac{3}{2}\right]$

59 $f(x) = \sqrt[3]{x - 2}$ in $[1, 3]$ [non è derivabile in $x = 2$]

60 $f(x) = x^2 + x$ in $[4, 6]$ $[x = 5]$

61 $f(x) = \dfrac{1}{1 + |x|}$ in $[-1, 2]$ [non è derivabile in $x = 0$]

62 $f(x) = \dfrac{x}{1 + x}$ in $[-17, -5]$ $[x = -9]$

63 $f(x) = e^{|x|-1}$ in $[-1, 1]$ [non è derivabile in $x = 0$]

64 $f(x) = x^3 - 4x^2 + x$ in $\left[\dfrac{1}{2}, 3\right]$ $\left[x = \dfrac{13}{6}\right]$

65 $f(x) = e^x$ in $[1, 2]$ $[x = \ln(e - 1) + 1]$

66 $f(x) = \ln(x + 2)$ in $[-1, 2]$ $\left[x = \dfrac{3}{2 \ln 2} - 2\right]$

7. $y = 4x + \dfrac{1}{x - 2}$ $\left[-\dfrac{5}{3} \; ; \; -1\right]$ **R.** $x = 2 - \sqrt{11}$

8. $y = \sqrt{4x - x^2}$ $[0 \; ; \; 3]$ **R.** $x = 1$

9. $y = \sqrt{1 - x}$ $[-15 \; ; \; 0]$ **R.** $x = -\dfrac{21}{4}$

10. $y = \sqrt{8x - x^2 - 12}$ $[3 \; ; \; 6]$ **R.** $x = 5$

Per quali valori del parametro a le seguenti funzioni verificano le ipotesi del teorema di Lagrange e per tali valori calcolare i punti di Lagrange

68 $f(x) = \begin{cases} ax + 10 - 2a & x < 2 \\ x^2 + 3x & x \geq 2 \end{cases}$ in $[0, 3]$ $\left[a = 7, \; x = \dfrac{13}{6}\right]$

69 $f(x) = \begin{cases} a(x^2 - 1) & x < 1 \\ \ln x & x \geq 1 \end{cases}$ in $[0, e]$ $\left[a = \dfrac{1}{2}, \; x = \dfrac{2e}{3}, \; x = \dfrac{3}{2e}\right]$

70 $f(x) = \begin{cases} 1 + ax & x < 0 \\ e^x & x \geq 0 \end{cases}$ in $[-1, \ln 2]$ $\left[a = 1, \; x = \ln \dfrac{2}{\ln 2 + 1}\right]$

71 $f(x) = \begin{cases} ax & x < 0 \\ -\dfrac{x}{x + 1} & x \geq 0 \end{cases}$ in $[-1, 1]$ $\left[a = -1, \; x = -1 + \dfrac{2}{\sqrt{3}}\right]$

72 $f(x) = \begin{cases} x^3 - 1 & x < 1 \\ \ln(x^a) & x \geq 1 \end{cases}$ in $[0, e]$ $\left[a = 3, \; x = \dfrac{3e}{4}, \; x = \dfrac{2}{\sqrt{3e}}\right]$

Stabilire se le seguenti funzioni verificano le ipotesi del teorema di Cauchy ed in caso affermativo calcolare le ascisse dei punti di Cauchy

166 $f(x) = x^2 - 6x + 2$ $g(x) = x^2 + 4$ in $[-3, -1]$ $[x = -2]$

167 $f(x) = x^2 + \frac{2}{5}x - 3$ $g(x) = -x^2 + x$ in $\left[-3, \frac{1}{3}\right]$ $\left[x = -\frac{4}{3}\right]$

168 $f(x) = \ln x$ $g(x) = \ln(x-3)$ in $[2, 4]$ [$g(x)$ non è definita]

169 $f(x) = x^2 + 1$ $g(x) = x^3 + x$ in $[-2, 1]$ $\left[x = \frac{\sqrt{13}-4}{3}\right]$

170 $f(x) = \frac{1}{x}$ $g(x) = x^2$ in $[1, 7]$ $[x = \sqrt[3]{28}]$

171 $f(x) = e^x$ $g(x) = 2x^2 - 7$ in $[-1, 1]$ [non è verificata una delle ipotesi]

172 $f(x) = \sin x - 1$ $g(x) = \cos x + 1$ in $\left[0, \frac{\pi}{2}\right]$ $\left[x = \frac{\pi}{4}\right]$

173 $f(x) = x^2 + 1$ $g(x) = |x| + 1$ in $[-1, 1]$ [$g(x)$ non è derivabile in $x = 0$]

1. $f(x) = x^2 - 4x + 1$, $g(x) = x - 3$ $[1 ; 5]$ **R.** $x = 3$

2. $f(x) = x^2 - 4x + 1$, $g(x) = -\frac{1}{2}x^2 + 3x - \frac{3}{2}$ $[-2 ; 3]$ **R.** $x = \frac{1}{2}$

3. $f(x) = -x^2 + 4x + 5$, $g(x) = x^2 - 6x$ $[-1 ; 3]$ **R.** $x = 1$

4. $f(x) = x^3 - x$, $g(x) = 1 - x^2$ $[-1 ; 2]$ **R.** Non esiste alcun punto

5. $f(x) = -x^3 + 2x^2$, $g(x) = x^2 + 3x - 10$ $[-1 ; 3]$ **R.** $x = \frac{13 \pm \sqrt{304}}{15}$

7. $f(x) = \frac{x-1}{x+3}$, $g(x) = 2 - x$ $[-2 ; 2]$ **R.** $x = \sqrt{5} - 3$

8. $f(x) = \operatorname{sen} x$, $g(x) = \cos x$ $[0 ; \pi]$ **R.** $x = \frac{\pi}{2}$

9. $f(x) = 2 \operatorname{sen} x + \cos x$, $g(x) = \operatorname{sen} x - 2 \cos x$ $\left[0 ; \frac{\pi}{2}\right]$ **R.** $x = \frac{\pi}{4}$

10. $f(x) = \operatorname{tg} x$, $g(x) = \operatorname{ctg} x$ $\left[\frac{\pi}{6} ; \frac{\pi}{3}\right]$ **R.** $x = \frac{\pi}{4}$

548. $f(x) = x^4 - x^2 + 3$ e $g(x) = x^4 + x^2 + 2$ in $[0 ; 1]$. | *R.* $c = \frac{\sqrt{2}}{2}$

549. $f(x) = \frac{2x+1}{x+1}$ e $g(x) = \frac{x+2}{2x+1}$ in $[0 ; 2]$. | *R.* $c = \frac{\sqrt{15}-1}{7}$

550. $f(x) = \operatorname{sen} x$ e $g(x) = \cos x$ in $\left[0 \ ; \ \frac{\pi}{2}\right]$. | $R.\ c = \frac{\pi}{4}$

552. $f(x) = \operatorname{sen} x + \cos x$ e $g(x) = \operatorname{sen} x - \cos x$ in $\left[0 \ ; \ \frac{\pi}{2}\right]$. | $R.\ c = \frac{\pi}{4}$