$$\lim_{n\to\infty} \frac{3\sqrt[4]{n}\,(3+n^4) - 11 n^{25/6}}{2006 + 10 n^{17/4}}$$

$$= \lim_{n\to\infty} \frac{9 n^{1/4} + \overbrace{3 n^{17/4}} - 11 n^{25/6}}{2006 + \underbrace{10 n^{17/4}}} = \lim_{n\to\infty} \frac{\frac{9}{n^4} + 3 - \frac{11}{n^{1/12}}}{\frac{2006}{n^{17/4}} + 10} = \frac{3}{10}$$

$$\boxed{\frac{17}{4}} > \frac{25}{6} \overset{?}{\Longleftarrow} 102 > 100$$

$$\frac{17}{4} - \frac{21}{6} = \frac{2}{24} = \frac{1}{12}$$

$$n^p n^q = n^{p+q}$$

$$\lim_{n\to\infty} \frac{9n + 3n^3 - 11 n^2}{2006 + 10 n^3}$$

$$= \lim_{n\to\infty} \frac{\frac{9}{n^2} + 3 - \frac{11}{n}}{\frac{2006}{n^3} + 10} = \frac{0+3-0}{0+10} = \frac{3}{10}$$

$$\lim_{x\to-3}\frac{e^{x+3}-1-\operatorname{sen}(3x+9)}{\underbrace{(x^2+2x-3)}_{(x+3)(x-1)}\ln(9+x)}=\lim_{x\to-3}\underbrace{\frac{1}{(x-1)\ln(9+x)}}_{\frac{-1}{4\ln 6}\text{ se } x=-3}\left[\frac{e^{x+3}-1}{x+3}-\frac{\operatorname{sen}3(x+3)}{x+3}\right]$$

$$=\frac{-1}{4\ln 6}\lim_{x\to-3}\left[\frac{e^{x+3}-1}{x+3}-\frac{\operatorname{sen}3(x+3)}{x+3}\right]=\frac{-1}{4\ln 6}\lim_{x\to-3}\left[\frac{e^{x+3}}{1}-\frac{3\cos 3(x+3)}{1}\right]$$

$$\lim_{t\to0}\frac{e^t-1}{t}=1=\lim_{t\to0}\frac{\operatorname{sen}t}{t}$$

$$=\frac{-1}{4\ln 6}\left\{1-3\right\}=\frac{1}{2\ln 6}$$

$$\lim_{x\to \emptyset} \frac{\ln(1+\operatorname{sen} x)}{1-e^{-x}} = \lim_{x\to\emptyset} \frac{\frac{1}{1+\operatorname{sen} x}\,\overbrace{\frac{d}{dx}(1+\operatorname{sen} x)}^{\cos x}}{e^{-x}} = \lim_{x\to 0} \frac{\cos x}{e^{-x}[1+\operatorname{sen} x]} = \frac{1}{1\cdot[1+\emptyset]} = 1$$

$$\lim_{x\to\emptyset} \frac{\operatorname{tg} 2x}{\ln(1+3x)} = \lim_{x\to\emptyset} \frac{\frac{1}{\cos^2 2x}\cdot 2}{\frac{1}{1+3x}\cdot 3} = \frac{\frac{1}{1}\cdot 2}{\frac{1}{1+\emptyset}\cdot 3} = \frac{2}{3}$$

$$f(x) = \begin{cases} \mu x^2 + \lambda x, & x \in [1,2] \\ -x, & x \in (-2, 1] \\ \mu x + 4, & x \in [-3, -2] \end{cases}$$

$$\left.\begin{array}{l} \lim_{x \to (-2)^-} f(x) = -2\mu + 4 \\ \lim_{x \to (-2)^+} f(x) = -(-2) = 2 \end{array}\right\} \text{uguali se e solo se } -2\mu + 4 = 2 \Rightarrow \mu = 1$$

$$\left.\begin{array}{l} \lim_{x \to 1^-} f(x) = -1 \\ \lim_{x \to 1^+} f(x) = \mu + \lambda \end{array}\right\} \text{uguali se e solo se } \mu + \lambda = -1$$

$$f: [-3,2] \to \mathbb{R}$$

f è continua $\iff \boxed{\begin{array}{l} -2\mu + 4 = 2 \\ \mu + \lambda = -1 \end{array}} \iff \boxed{\begin{array}{l} \lambda = -2 \\ \mu = 1 \end{array}}$

$$f(x) = \begin{cases} x + 4, & -3 \le x \le -2 \\ -x, & -2 \le x \le 1 \\ x^2 - 2x = x(x-2), & 1 \le x \le 2 \end{cases}$$

$\cancel{f(x) = 5x e^{3x}}$

$f(x) = (5x+2)\, e^{3x}$

$\lim_{x \to +\infty} f(x) = +\infty$

$\lim_{x \to -\infty} f(x) = 0$

$-$ $-2/5$ $+$ $f(x)$

$\hookrightarrow f'(x) = 5e^{3x} + (5x+2) \cdot 3e^{3x}$

$= (15x + 11)\, e^{3x}$

$-$ MIN $+$ $f'(x)$

decrescente $-11/15$ crescente $f(x)$

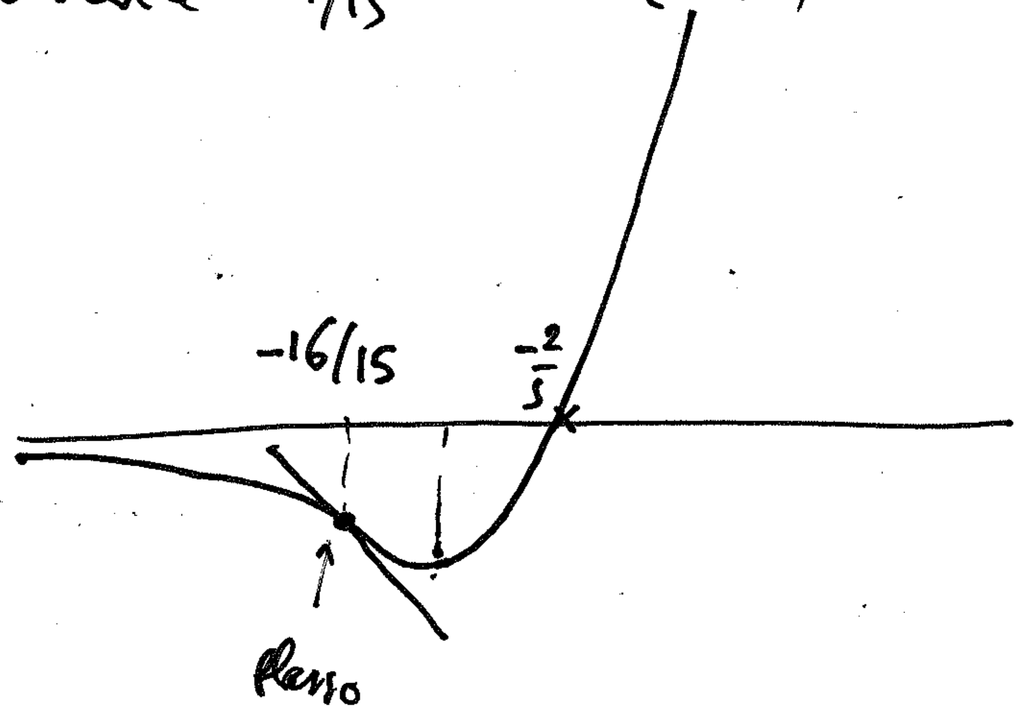
$f''(x) = 15e^{3x} + (15x+11) \cdot 3e^{3x}$

$= (45x + 48)\, e^{3x}$

$= 3(15x + 16)\, e^{3x}$

$-$ flesso $+$ $f''(x)$

concava $-16/15$ convessa



$$\lim_{x\to 0} \frac{\cos 3x - \cos 5x}{x^2} = \lim_{x\to 0} \frac{-3\,\mathrm{sen}\,3x + 5\,\mathrm{sen}\,5x}{2x} = \lim_{x\to 0} \frac{-9\cos 3x + 25\cos 5x}{2}$$

$$= \frac{-9+25}{2} = 8$$

$$a_n = \frac{9n-5}{4n} = \frac{9}{4} - \frac{5}{4n} \longrightarrow \frac{9}{4} \qquad \left|a_n - \frac{9}{4}\right| = \frac{5}{4n}$$

$$\left|a_n - \frac{9}{4}\right| < \varepsilon \leftrightarrow \frac{5}{4n} < \varepsilon \leftrightarrow n > \frac{5}{4\varepsilon}$$

Per ogni $\varepsilon > 0$ esiste $N(\varepsilon)$ [= primo intero $> \frac{5}{4\varepsilon}$] tale che

$$\left|a_n - \frac{9}{4}\right| < \varepsilon, \quad n \geq N(\varepsilon)$$

$$f(x) = \ln\left(9x^2 - 3\,\mathrm{sen}(9\pi x)\right), \quad x_0 = -\frac{1}{3}$$

$$\boxed{y - f(x_0) = f'(x_0)(x - x_0)}$$

$$\rightarrow f(x_0) = f\left(-\frac{1}{3}\right) = \ln\left(1 - 3\,\mathrm{sen}(-3\pi)\right)$$

$$\llcorner \ln 1 = \varnothing$$

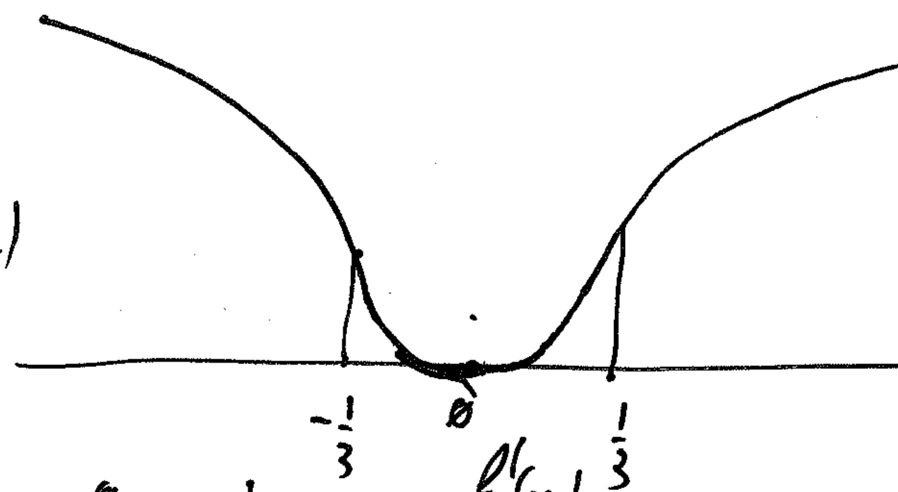
$$f'(x) = \frac{18x + 3\cos(9\pi x) \cdot 9\pi}{9x^2 - 3\,\mathrm{sen}(9\pi x)} \rightarrow f'(x_0) = \frac{-6 + 27\pi\cos(-3\pi)}{1} = -6 - 27\pi$$

$$y = (-6 - 27\pi)\left(x + \frac{1}{3}\right)$$

$f(x) = \ln(9x^2+1)$, $x \in \mathbb{R}$

$f(0) = \ln 1 = 0$

+	0	+	$f(x)$
	0		



$$f'(x) = \frac{\frac{d}{dx}(9x^2+1)}{9x^2+1} = \frac{18x}{9x^2+1}$$

–	0	+	$f'(x)$
decrescente	MIN	crescente	$f(x)$

$$f''(x) = \frac{(9x^2+1)\cdot 18 - 18x \cdot 18x}{(9x^2+1)^2} = \cancel{\frac{18[9x^2+1-18x]}{(9x^2+1)^2}} = \cancel{\frac{18[9(x-1)^2-8]}{(9x^2+1)^2}}$$

$$\cancel{f''(x) = 0 \Leftrightarrow 9(x-1)^2 = 8 \Leftrightarrow x-1 = \pm\frac{2}{3}\sqrt{2} \Rightarrow x =}$$

$$f''(x) = \frac{18[(9x^2+1) - 18x^2]}{(9x^2+1)^2} = \frac{18(1-3x)(1+3x)}{(9x^2+1)^2}$$

–	$-1/3$	+	$+1/3$	–
concava		convessa		concava

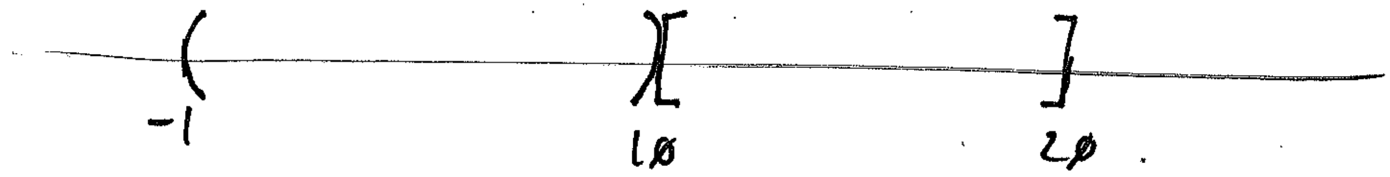
$$A = \{x \in \mathbb{R} : x^2 - 9x - 10 < 0\} \cup \{x \in \mathbb{R} : |x-15| \leq 5\}$$

$$x^2 - 9x - 10 < 0$$

$$(x-10)(x+1) < 0$$

$$-1 < x < 10$$

$$|x-15| \leq 5 \Longrightarrow 10 \leq x \leq 20$$



$$A = (-1, 20]$$

$\inf A = -1$ $\quad$ $\min A$ non esiste

$\sup A = 20 = \max A$

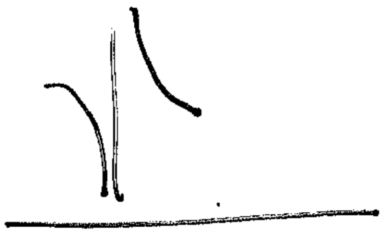
$x = \frac{1}{2} \pm$

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

$$\lim_{x \to \pm\infty} \left(f(x) - (x-1)\right) = \emptyset$$

$y = x - 1$ è asintoto obliquo

$x = 0$ è asintoto verticale



$$f'(x) = 1 - \frac{2}{x^2} = \frac{x^2 - 2}{x^2}$$

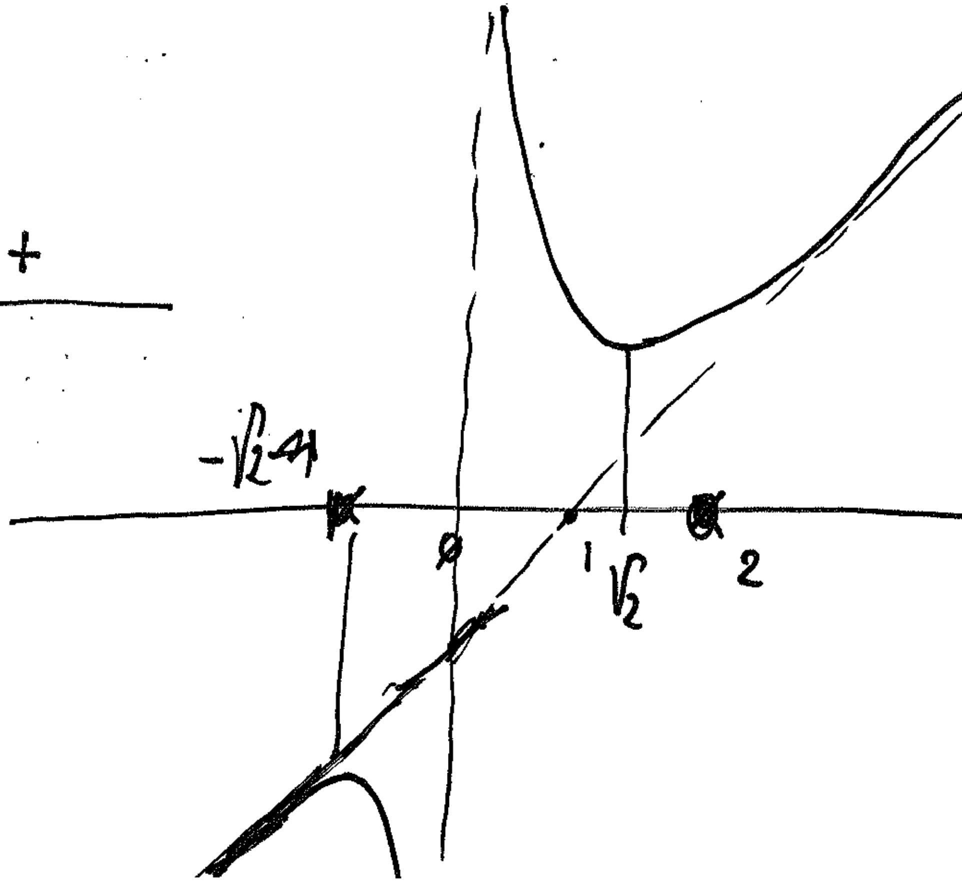
$+$ MAX $-$ $\nexists$ $-$ MIN $+$

$-\sqrt{2}$ $\quad \emptyset \quad$ $+\sqrt{2}$

$$f''(x) = \frac{4}{x^3}$$

$-$ $\quad \nexists \quad$ $+$ $\quad f''(x)$

concava $\quad \emptyset \quad$ convessa



$$(\zeta+\eta)^{77} = \sum_{k=0}^{77} \binom{77}{k} \zeta^{k} \eta^{77-k} = \eta^{77} + 77\zeta\eta^{76} + (77\times 38)\zeta^{2}\eta^{75} + \cdots$$

$$= \zeta^{77} + 77\zeta^{76}\eta + (77\times 38)\zeta^{75}\eta^{2} + \cdots$$

$$(1-3z)^{77} = 1 - \underbrace{3\times 77}_{231} z + 9\times 77\times 38\, z^{2} + \cdots$$

$\zeta = 1 \quad \eta = -3z$

$\downarrow$

$\zeta^{k} = 1$

$$\binom{77}{3} = \frac{77\times \cancel{76}^{38}\times \cancel{75}^{25}}{1\times \cancel{2}\times \cancel{3}}$$

$$\binom{77}{0} = 1 \qquad \binom{77}{1} = 77$$

$$\binom{77}{2} = \frac{77\times 76}{1\times 2} = 77\times 38$$

$$f(x) = \operatorname{sen}^2 x - 5 \operatorname{sen} x + 6 = [\operatorname{sen} x - 2][\operatorname{sen} x - 3] > \emptyset$$

$$f'(x) = \underline{2 \operatorname{sen} x \cos x - 5 \cos x} = 2 \operatorname{sen} x \underbrace{\left[\cos x - \frac{5}{2}\right]}_{< \emptyset}$$

$$= \operatorname{sen} 2x - 5 \cos x$$

$$f(x + 2\pi) = f(x)$$

$\emptyset$	$+$	π	$-$	2π	$+$	3π	$-$	4π	$\dots$	$f'(x)$
MIN		MAX		MIN		MAX		MIN		

$$f''(x) = 0 \leftrightarrow \operatorname{sen} x = \frac{-5 \pm \sqrt{25 + 32}}{-8} = \frac{5}{8} \mp \frac{1}{8}\sqrt{57}$$

$$f''(x) = \underbrace{2\cos^2 x - 2 \operatorname{sen}^2 x}_{} + 5 \operatorname{sen} x = 2 - 4 \operatorname{sen}^2 x + 5 \operatorname{sen} x$$

$.(0,6)$ $\quad .(0,6)$