Studio funzioni

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1) $f(x) = \left\{\begin{matrix} \sin x^2 + a \to x \leq 0 \\ \dfrac{\ln(1+x)}{2x} + \dfrac{3}{2} \to x > 0 \end{matrix}\right\}$

Continua:

$\lim_{x\to 0^+} f(x) = \frac{0}{0} + \frac{3}{2} \to indefinito$

$\frac{\ln(1+x)}{2x} = \frac{\frac{1}{1+x}}{2} = \frac{1}{1+x} * \frac{1}{2} = \frac{1}{2+2x} + \frac{3}{2}$

$\lim_{x\to 0^+} f(x) = \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2$

$\sin 0 + a = 2$

$a = 2$

2) $f(x) = x^2 + 2x + 2, \frac{d}{dx} \ln f(x), x = 1$

$f(x) = \ln(x^2 + 2x + 2)$

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

$f'(1) = \frac{4}{5}$

3) $f(x) = x^5 + x^3 + 1$

Quanti flessi ha?

$f'(x) = 5x^4 + 3x^2 > 0$

#DERIVATA SECONDA#

4) $\lim_{x\to\infty} \frac{n^2 - 2\ln^{10} n - n\sqrt{n^3+1}}{2n^2 + e^{\frac{1}{n}} - n\sqrt{n}} \sim \frac{n^2 - n\sqrt{n^3+1}}{2n^2}$

$= \frac{n^2 - n * n^{\frac{3}{2}} + n}{2n^2} \sim \frac{-n * n^{\frac{3}{2}}}{2n^2} = \frac{-n^{\frac{5}{2}}}{2n^2} = -\infty$

5) $\sqrt{2x^2 - 1} >$ -1

$2x^2 - 1 > 0$

$2x^2 > 1$

$x^2 > \frac{1}{2}$

$x > \pm\sqrt{\frac{1}{2}}$

$\left(-\infty, -\sqrt{\frac{1}{2}}\right) U \left(\sqrt{\frac{1}{2}}, +\infty\right)$

6) $f(x) = \sqrt{x-4} - \frac{x}{2}$

$x - 4 \geq 0 \to x > 4$

$D: [4, +\infty)$

$\lim_{x\to 4^-} f(x) = -2$

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

Asintoto verticale y = 4

$f'(x) = \frac{1}{2\sqrt{x-4}} - \frac{1}{2}$

$\frac{1-\sqrt{x-4}}{2\sqrt{x-4}}$

$x - 4 \geq 0 \to x \geq 4$

$1 - \sqrt{x-4} \geq 0 \to -\sqrt{x-4} \geq -1$

$\sqrt{x-4} \leq 1$

$x - 4 \leq 1 \to x \leq 5$

4 5

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$4 < x < 5$

Punto massimo assoluto: f(5)

Punto massimo relativo: f(4)

Taylor:

$$f(x) = \sqrt{x-4} - \frac{x}{2}$$

$$f'(x) = \frac{1-\sqrt{x-4}}{2\sqrt{x-4}} = \frac{1}{2\sqrt{x-4}} - \frac{1}{2}$$

$$f''(x) = \frac{-2\frac{1}{2\sqrt{x-4}}}{4*(x-4)} = -\frac{1}{4(x-4)\sqrt{x-4}}$$

$$f(x_0) + f'(x_0)(x-x_0) + f''(x_0)(x-x_0)^2$$

$$x_0 = 4$$

$$-\frac{4}{2} - \frac{1}{2}x \to -\frac{1}{2}x = \frac{4}{2} \to -x = 4 \to x = -4$$

$$\int_4^8 f(x) = \int \sqrt{x-4} - \int \frac{x}{2} \to \int (x-4)^{\frac{1}{2}} - \frac{1}{2}\int x$$

$$\frac{(x-4)^{\frac{1}{2}+1}}{\frac{1}{2}+1} = \frac{(x-4)^{\frac{3}{2}}}{\frac{3}{2}} - \frac{x^2}{4} = \frac{2}{3}(x-4)^{\frac{3}{2}} - \frac{x^2}{4}$$

$$\int_4^5 f(x) - \int_5^8 f(x)$$

5-4

$$\left(\frac{2}{3}(5-4)^{\frac{3}{2}} - \frac{5^2}{4}\right) - \left(-\frac{4^2}{4}\right)$$

$$\left(\frac{2}{3} - \frac{25}{4}\right) + 4 \to \frac{8-75}{12} + 4 = -\frac{19}{12}$$

8-5

$$\left(\frac{2}{3}(8-4)^{\frac{3}{2}} - \frac{8^2}{4}\right) - \frac{67}{12} \to wtf$$

Qui c'è troppo di sbagliato