$$f(x) \quad 1 + x + e^{-x} + x^2 + 3x^4 + 5x^7 = 1 + \left(\frac{1}{e} - x + \frac{x^2}{2}\right) + \left(x + \frac{1}{2}x^2\right) + \left(x^2\right) + o(x^2)$$

$f(x) = e^{-x}$	$f(0) = \frac{1}{e}$	$f(x) = x$	$f(0) = 0$	$f(x) = x^2$	$f(x_0) = 0$
$f'(x) = -e^{-x}$	$f'(0) \; -1$	$f'(x) = 1$	$f'(0) = 1$	$f'(x) = 2x$	$f'(x_0) = 0$
$f''(x) = +e^{-x}$	$f''(0) = +1$	$f''(x) = 1$	$f''(0) = 1$	$f''(x) = 2$	$f''(x_0) = 2$
$P(x) = \frac{1}{e} - x + \frac{x^2}{2}$		$P(x) = 1(x) + \frac{1}{2}(x)^2$		$P(x) = \frac{\cancel{2}x^2}{\cancel{2}}$	

$$P(x) = 1 + \left(\frac{1}{e} - x + \frac{x^2}{2}\right) + \left(x + \frac{1}{2}x^2\right) + \left(x^2\right) + o(x^2)$$

$$P(1) \; \cancel{1} + \frac{1}{e} - \cancel{1} + \frac{1}{2} + 1 + \frac{1}{2} + 1 = 3 + \frac{1}{e}$$

$$f(x) = x^3 \ln(3+x^2)$$

$$f'(x) = 3x^2 \ln(3+x^2) + x^3 \frac{1}{3+x^2} \cdot 2x =$$

$$3x^2 \ln(3+x^2) + \frac{2x^4}{3+x^2}$$

$$f''(x) = \left(6x \ln(3+x^2) + 3x^2 \frac{1}{3+x^2} \cdot 2x\right) + \left(\frac{8x^3(3+x^2) - (2x^4(2x))}{(3+x^2)^2}\right)$$

$$f''(x) = \left(6x \ln(3+x^2) + \frac{6x^2}{3+x^2}\right) + \left(\frac{24x^3 + 8x^5 - 4x^5}{(3+x^2)^2}\right)$$

$$f''(1) = \left(6 \ln 4 + \frac{3}{2}\right) + \frac{24+8-4}{(4)^2} = 6 \ln 4 + \frac{3}{2} + \frac{\overset{7}{28}}{16\ 3} =$$

$$6 \ln 4 + \frac{24+28}{16} = 6 \ln 4 + \frac{\cancel{52}\ \cancel{26}\ 13}{\cancel{16}\ \cancel{8}\ 4}$$

$$f(x) = 9\sqrt[3]{9x} - x^3$$

$$f'(x) = 9 \cdot \frac{1}{3\sqrt[3]{(9x)^2}} \cdot 9 - 3x^2 = \frac{27}{\sqrt[3]{(9x)^2}} - 3x^2 = 0$$

$$\frac{f(b)-f(a)}{b-a} = \frac{9\sqrt[3]{27} - 27}{3} = \frac{9 \cdot 3 - 27}{3} = 0$$

$$\frac{27}{\sqrt[3]{(9x)^2}} - 3x^2 = 0$$

$$27 - 3x^2\left(\sqrt[3]{(9x)^2}\right) = 0$$

$$x^2\left(\sqrt[3]{(9x)^2}\right) = 9$$

$$x^2 \cdot \left(3\sqrt[3]{x^2}\right) = 9$$

$$x^2\sqrt[3]{3x^2} = 3$$

$$x^6 \cdot 3x^2 = 9$$

$$x^8 = 9$$

$$x = \left((3)^2\right)^{\frac{1}{8}} = 3^{\frac{1}{4}}$$

$f: \mathbb{R} \to \mathbb{R} \quad f'(0) = 0 \quad f''(0) = 0 \qquad f \quad x = 0$

$$f'''(x) = \cos x$$

$$\int \cos x \, dx = \sin x + c = f''(x) \Rightarrow \boxed{f''(x) = \sin x}$$

$$f''(0) = \sin 0 + c = 0 \qquad c = 0$$

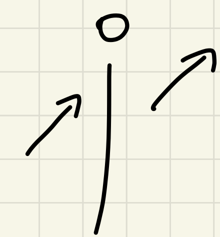
$$\int \sin x \, dx = -\cos x + c \qquad \boxed{f'(x) = -\cos x + 1}$$

$$f'(0) = -\cos x + c = 0 \qquad c = 1$$

studio monotonia

$$-\cos x + 1 > 0$$

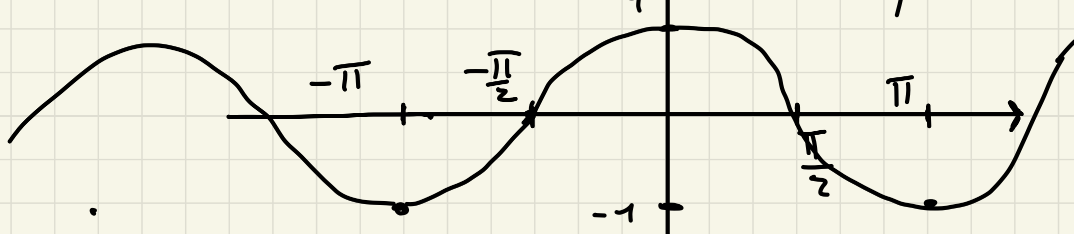
$$\cos x < 1 \qquad (-2k\pi, 0)\,(0, 2k\pi)$$



$$\lim_{x \to 0^-} -\cos x + 1 = 0$$

no p.ti di flesso

$$\lim_{x \to 0^+} -\cos x + 1 = 0$$



$f(x) = 2x^2 + k \ln x$ convessa in $(0, +\infty)$ per

$$f'(x) = 4x + \frac{k}{x}$$

$$f''(x) = 4 + k \cdot \frac{(-1)}{x^2} = 4 - \frac{k}{x^2}$$

$4 - \frac{k}{x^2} > 0 \qquad x > 0$

$k < 4x^2$

$2 < 4x^2$ ✗

$1 < 4x^2$

$x > \frac{1}{2}$ ✗

$-1 < 4x^2$ ✓

$f(x) = \ln(\cos x) \quad f(0) = 0$

$f'(x) = \frac{-\sin x}{\cos x} = -tg\,x \quad f'(0) = 0$

$f''(x) = -\frac{1}{\cos^2 x} \quad f''(0) = -1$

$P(x) = 0 + 0 - \frac{(1)^2}{2}(x)^2 = -\frac{x^2}{2}$

$f(x) = \ln(1+4x^2) \quad D \quad 1+$

$f'(x) = \frac{1}{1+4x^2} \cdot 8x$

$f''(x) = \frac{8(1+4x^2) - 8x(8x)}{(1+4x^2)^2} = \frac{8+32x^2-64x^2}{(1+4x^2)^2} = \frac{8-32x^2}{(1+4x^2)^2} = \frac{8(1-4x^2)}{(1+4x^2)^2}$

$$\frac{8(1-4x^2)}{(1+4x^2)^2} > 0$$

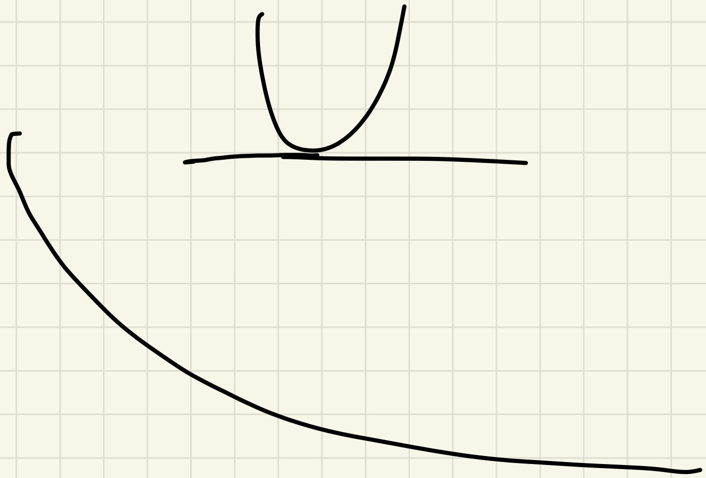
$$1 - 4x^2 > 0$$

$$4x^2 < 1$$

$$-\frac{1}{2} < x < \frac{1}{2}$$

	$-\frac{1}{2}$		$\frac{1}{2}$	
$-$		$+$		$-$

$f: \mathbb{R} \to \mathbb{R}$



$$f(x) = 1 + x + e^{-x} + x^2 + \cancel{3x^4} + \cancel{5x^7} \qquad f(0) = 1 + 1 = 2$$

$$f'(x) = 1 - e^{-x} + 2x \qquad f'(0) = 1 - 1 = 0$$

$$f''(x) = +e^{-x} + 2 \qquad f''(0) = 3$$

$$P(x) = 2 + \frac{3x^2}{2} \quad P(1) = 2 + \frac{3}{2} = \frac{7}{2}$$