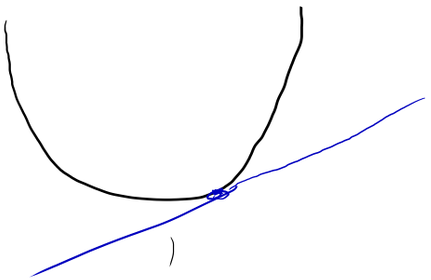
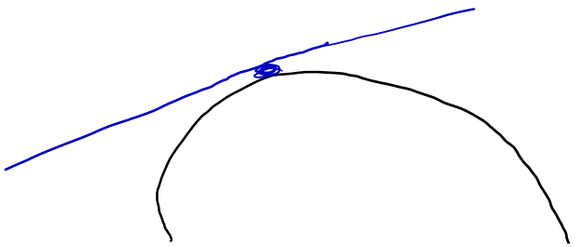
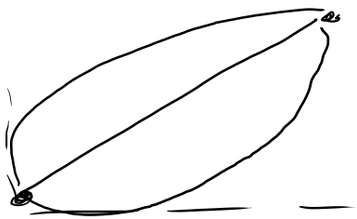
convex

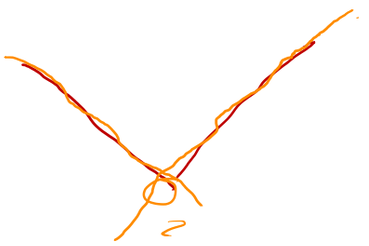


concave

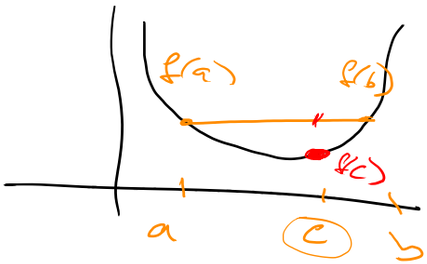


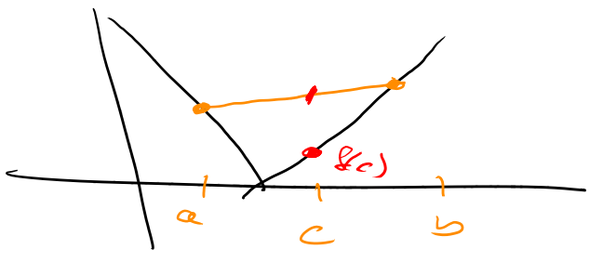


1x1

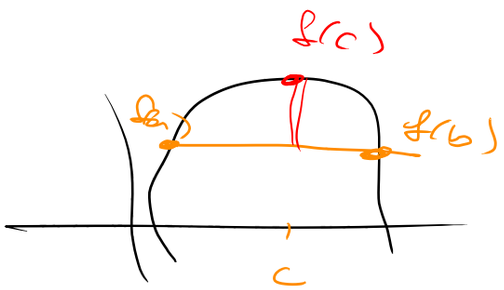


convex





concave



conCAVE

$f'' \geq 0$ convex $\cup$

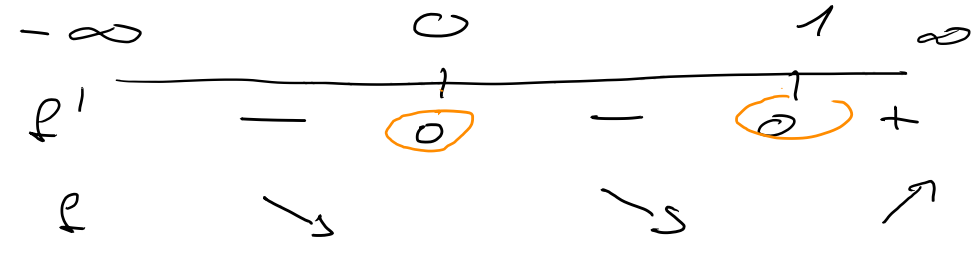
$f'' \leq 0$ concave $\cap$

$$f(x) = 3x^4 - 4x^3$$

- $D_f = \mathbb{R}$
- $f'(x) = 12x^3 - 12x^2$

$$12\ x^2(x-1)$$

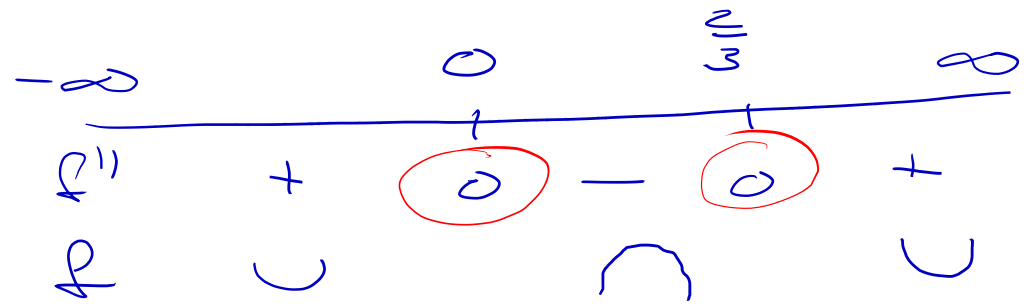
$$x_0 = 0 \qquad x_1 = 1$$



- $f''(x) = 36x^2 - 24x$

$$12x(3x-2)$$

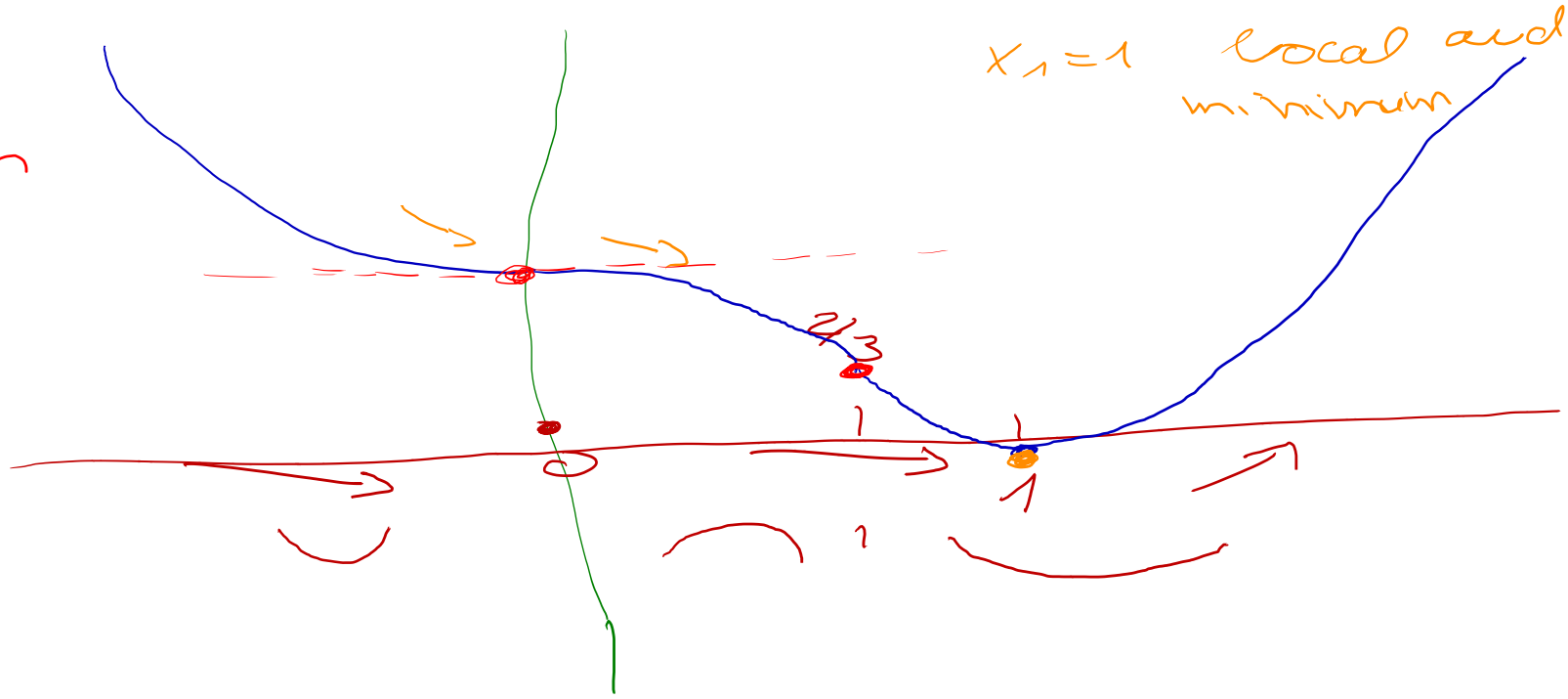
$$x_2 = 0 \qquad x_3 = \frac{2}{3}$$



inflation

$x_2 = 0$

$x_3 = \frac{2}{3}$



Asymptotes

$y = kx + q$ $\neq$

$k = 1$

$q \neq \pi/2$

at ∞

$y = 1x + \pi/2$

$f(x) = x + \operatorname{arctan} x$

$$k = \lim_{x \to \infty} \frac{f(x)}{x} = \lim_{x \to \infty} \frac{x + \operatorname{arctan} x}{x} =$$

$\therefore$ angle $\to \pi/2$

∞

$$= \lim_{x \to \infty} 1 + \frac{\operatorname{arctan} x}{x} = 1 + 0 = 1$$

$\operatorname{arctan} x \to \infty$

$\frac{\pi}{2}$

∞

$= 0$

$\neq \pm\infty$

$\downarrow$

no asymp.

kx

$$q = \lim_{x \to \infty} \underbrace{x + \operatorname{arctan} x}_{f(x)} - 1 \cdot x =$$

$-kx$

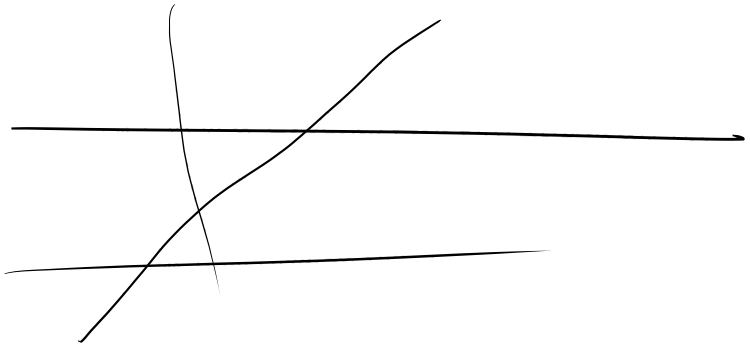
$$= \lim_{x \to \infty} \operatorname{arctan} x = \pi/2$$

$\neq \pm\infty$

$\downarrow$

no asymp.

asympt. $y = kx + q$



asymptote

horizontal as.

slant / oblique as.