

$$\int_{\pi/4}^{\pi/3} \left((\cos x) \log(\sin x) + (\cos x)^{-2} \right) dx?$$

$$t = \sin x \\ dt = \cos x$$

$$\cos x \cdot \log(\sin x) + \frac{1}{\cos^2 x} = \int_{\pi/4}^{\pi/3} \cos x \cdot \log(\sin x) dx + [\tan x]_{\pi/4}^{\pi/3} =$$

$$= \int_{\pi/4}^{\pi/3} \log t \cdot dt + [\tan x]_{\pi/4}^{\pi/3} = \left[t \cdot (\log t - 1) \right]_{\frac{\sqrt{2}}{2}}^{\frac{\sqrt{3}}{2}} + [\tan x]_{\pi/4}^{\pi/3} =$$

$$= \frac{\sqrt{3}}{2} \cdot \log \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \log \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} + \sqrt{3} - 1 =$$

$$[\sin x \cdot \log(\sin x) - \sin x] + [\tan x]$$

$$\sin 0 = 0$$

$$\sin \frac{\pi}{2} = 1$$

$$\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$$

$$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\tan \frac{\pi}{4} = 1$$

$$\tan \frac{\pi}{3} = \sqrt{3}$$

$$= \int_1^{\sqrt{3}} \frac{\log(\arctan x)}{1+x^2} dx?$$

$$t = \arctan x \\ dt = \frac{1}{1+x^2}$$

$$\int \frac{1}{1+x^2} = \arctan x \rightarrow (\arctan x)' = \frac{1}{1+x^2}$$

$$\int_1^{\sqrt{3}} \log(t) dt = \left[t \cdot \log t - t \right]_{\substack{t = \frac{\pi}{4} \\ x = \frac{\pi}{4}}}^{\substack{t = \frac{\pi}{3} \\ x = \frac{\pi}{3}}} \\ = \left[\arctan x \cdot \log(\arctan x) - \arctan x \right]_1^{\sqrt{3}}$$

$$= \frac{\pi}{3} \cdot \log \frac{\pi}{3} - \frac{\pi}{3} - \frac{\pi}{4} \cdot \log \frac{\pi}{4} + \frac{\pi}{4}$$

Najděte lokální a globální extrém:

$$f(x) := |x-2|^3 e^x$$

$$x < 2: f(x) := (-x+2)^3 e^x$$

$$x \geq 2: f(x) := (x-2)^3 e^x$$

$$x < 2: f'(x) = -3 \cdot (-x+2)^2 \cdot e^x + (-x+2)^3 e^x$$

$$x \geq 2: f'(x) = 3 \cdot (x-2)^2 \cdot e^x + (x-2)^3 e^x$$

$$x < 2: f'(x) = (-x+2)^2 \cdot e^x \cdot (-x-1)$$

$$x \geq 2: f'(x) = (x-2)^2 \cdot e^x \cdot (x+1)$$

$$f \leq y = 2^3 \cdot e^0 = 2^3 = 8 \quad [0, 8]$$

$$f \leq x \quad |x-2|^3 \cdot e^x = 0 \quad [2, 0]$$

$$e^x = 0 \quad \vee \quad |x-2|^3 = 0$$

$$e^x \neq 0 \quad |x-2|^3 = 0$$

in other def.
oborn

$$x = 2$$

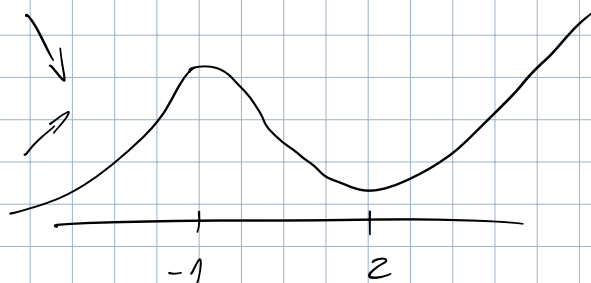
$$\begin{aligned} \frac{2-x}{-dx} &= \frac{1}{dx} \\ 3 \cdot 2^2 &= -3(2-x)^2 \end{aligned}$$

$$x < 2: f'(x) < 0: -x-1 < 0 \quad x > -1$$

$$f'(x) > 0: -x-1 > 0 \quad x < -1$$

$$f'(x) < 0: (-1, 2)$$

$$f'(x) > 0: (-\infty, -1)$$



$$x \geq 2: f'(x) < 0: x+1 < 0 \quad x < -1$$

$$f'(x) > 0: x+1 > 0 \quad x > 1$$

$$f'(x) < 0: \emptyset$$

$$f'(x) > 0: (2, +\infty)$$

Lokální minimum je pro $x = 2$, lokální maximum je pro $x = -1$.

To je zároveň
globální min.

↑
global lokální min

$$\frac{1}{e^x}$$

$$\stackrel{AL}{=} \lim_{x \rightarrow -\infty} |x-2|^3 \cdot \lim_{x \rightarrow -\infty} e^x \stackrel{AL}{=} +\infty \cdot 0 = 0$$

$$\lim_{x \rightarrow -\infty} (-x+2)^3 = (-x+2) \cdot (2-x)^2 = (-x+2) \cdot (4-4x+x^2) =$$

$$-4x + 4x^2 - x^3 + 8 - 8x + 2x^2 =$$

$$-x^3 + 6x^2 - 12x + 8$$

Spačítajte objem $V(1, 2, \log x)$

$$f = \log x \quad g = x \cdot \log x - x$$

$$f' = \frac{1}{x} \quad g' = \log x$$

$$\int \log x - 1 = \int \log x - \int 1$$

$$x \cdot \log x - x - x$$

$$\begin{aligned} \int \log^2 x &= \int \log x \cdot \log x = \log x \cdot (x \cdot \log x - x) - \int (x \cdot \log x - x) \cdot \frac{1}{x} \\ &= \log^2 x \cdot x - \log x \cdot x - (x \cdot \log x - x - x) \\ &= \log^2 x \cdot x - 2 \log x \cdot x + 2x \end{aligned}$$

$$V = \pi \int_1^2 \log^2 x = \pi (2 \cdot \log^2 2 - 4 \log 2 + 4 - 0 + 0 - 2) = \pi (2 \log^2 2 - 4 \log 2 + 2)$$

$$f = \sin x$$

$$df = \cos x$$

$$\begin{aligned} \int \cos x \log(\sin x) + (\cos x)^{-2} &= \int \cos x \cdot \log(\sin x) + \int \frac{1}{\cos^2 x} = \int \log(t) dt + \tan x = \\ &= \sin x \cdot \log(\sin x) - \sin x + \tan x \end{aligned}$$

$$f = \arctan x$$

$$df = \frac{1}{1+x^2}$$

$$\int \frac{\log(\arctan x)}{1+x^2} \quad \Rightarrow \quad \int \log(t) dt = \arctan x \cdot \log(\arctan x) - \arctan x$$

$$\int \frac{1+x}{\sqrt{x}} = \int x^{-\frac{1}{2}} + \int x^{\frac{1}{2}} = 2x^{\frac{1}{2}} + \frac{2}{3}x^{\frac{3}{2}} + C$$

$$\begin{aligned} \int x \cdot e^{-x^2} & \quad \begin{matrix} f = -x^2 \\ df = -2x dx \end{matrix} \\ &= -\frac{1}{2} \int e^t dt = -\frac{1}{2} e^t = -\frac{1}{2} \cdot e^{-x^2} + C \end{aligned}$$

$$f = x \quad g = -\cos x$$

$$f' = 1 \quad g' = \sin x$$

$$\int x \cdot \sin x = x \cdot (-\cos x) - \int 1 \cdot (-\cos x) = x \cdot (-\cos x) + \sin x$$

$$n \sin \frac{n\pi}{2}$$

$$\sin \frac{\pi}{2}, \sin \pi, \sin \frac{3\pi}{2}, \sin 2\pi$$

$$\parallel \frac{\sqrt{2}}{2}$$

$$\parallel 1$$

$$\parallel \frac{\sqrt{2}}{2}$$

$$\parallel 0$$

$$n$$

$$\limsup = n \frac{\sqrt{2}}{2} = +\infty$$

$$\liminf = n^0 = 1$$