$x^3 + a\,x^2 + bx$ loc Extr/abh von a:b

$x^3 - 3x + a \Rightarrow 1/2/3$ reelle Nst/welche a

$$\begin{cases} \mathbb{R} \xrightarrow[\text{diff}]{} \mathbb{R} \\ {}^{x}\eta \underset{\infty}{\rightsquigarrow} c \end{cases} \Rightarrow \begin{cases} \bigvee a_n \rightsquigarrow \infty \\ {}^{a_n}\underline{\eta} \rightsquigarrow 0 \end{cases} \quad \text{MWS}$$

$p \in \mathbb{R}[x]$: $n = \deg p$: p bes auf jedem Int $a|b$

$$R \text{ gross } \Rightarrow p \text{ hat on } -R|R \begin{cases} \text{no max/min} & n \text{ even} \\ \text{nur max} & n \text{ odd } / a_n < 0 \\ \text{nur min} & n \text{ odd } a_n > 0 \end{cases}$$

$p(x) \in \mathbb{R}[x]$: nur reelle Nst in $a|b \Rightarrow p'(x)$ nur reelle Nst in $a|b$

${}^{x}p = (x-1)(x-2)(x+5)(x+1)(x-1/2) \Rightarrow$ Poly ${}^{x}\underline{p}$ 4 verschiedene Nst

$${}^{x}\eta_n = \sum_{m}^{0|n} \frac{x^m}{m!} \Rightarrow \begin{cases} \text{no real Nst } \eta_n > 0 & n \in 2\mathbb{N} \\ \eta_n \text{ genau eine real Nst} & n \in 2\mathbb{N}+1 \end{cases}$$

$n = 0/n = 1$ klar $/\,\underline{\eta}_n = {}^{\eta_{n-}}$

$$\mathbb{R} \xrightarrow[+\text{diff}]{} \mathbb{R} \begin{cases} 0 \leqslant \underline{\eta} \leqslant \eta \\ \eta \text{ hat Nst} \end{cases} \Rightarrow \eta = 0/ \text{ auch ohne Nst?}$$

$$x > -1 \Rightarrow \frac{x}{1+x} \leqslant {}^{1+x}\log$$

$$\bigwedge_{\alpha \geqslant 1:} \bigwedge_{\alpha \in 0|1} \bigwedge_{x \geqslant -1} \overset{\text{allg}}{\underset{\text{Bern}}{\Rightarrow}} (1+x)^{\alpha} \geqslant 1 + \alpha x \text{ Extremwert}$$

Kurvendiskussion/crit pts/loc-glob Extr/Wendepkt/Mon-Interv/Bild-Interv

$\left(x^2 - 2\right) e^{-2x}$ crit/type/Monot-Inv

$x^4 + 2\,x^3 - 2\,x^2 + 1$: $\frac{x^4}{2} + 2\,x^3 + 2\,x^2 - 4$: $x^4 - 2\,x^2 y + x^2 + y^2$ glob Extr?

$$4\,x^3 + 15\,x^2 - 18x + 1$$

$$\underline{?} = 12\,x^2 + 30x - 18 = 12\,(x+3)\left(x - \frac{1}{2}\right)$$

$$e^{-x}\,x^n \text{ Extrema/Wendepkt}$$

$$3x\,e^y - x^3 - e^{3y} \text{ surj}$$

$$x^3 - \frac{3}{2}\,(a+b)\,x^2 + 3abx + c$$

$${}^x\cos - {}^x\cos^2\text{:} \quad \text{Nst/Extr}$$

$$g\,(x) = 3\,x^4 - 8\,x^3 - 6\,x^2 + 24x\text{:} \quad g\left(-2|\frac{3}{2}\right)\text{:} \quad g\left(0|\frac{11}{5}\right)$$

$$g\,(x) = x^3 - x + 1\text{:} \quad g\left(\frac{1}{2}|3\right)\text{:} \quad g\,(0|2)$$

$$g\,(x) = 4\,x^3 - 15\,x^2 + 12x - 6\text{:} \quad g\,(-1|4)\text{:} \quad g\,(-2|3)$$

$$g\,(x) = x^3 - 3\,x^2 + 1\text{:} \quad g\left(-\frac{1}{2}|4\right)$$

$$g\,(x) = x^4 - 4\,x^2 + 2\text{:} \quad g\,(-3|2)$$

$$g\,(x) = x - 3\cos x\text{:} \quad g\,(-\pi|\pi)$$

$$g\,(x) = \frac{\log x}{\sqrt{x}}\text{:} \quad g\left(\mathbb{R}_{>}\right)$$

$$p\,(x) = x + 1 - x^3\text{:} \quad \text{find } a|b \begin{cases} \text{max/min innen} \\ \text{max/min im Rand} \end{cases}$$

$$e^{-x}\,x^3 \text{ abs/rel Min}_{\mathbb{R}_+}$$

$$\begin{cases} C\,(x) = 150 + 50x + \frac{1}{2}x^2 & \text{cost function} \\ p = 70 & \text{price per item} \end{cases} \Longrightarrow \begin{cases} P\,(x) & \text{profit function} \\ P\,(x) \geqslant 0 & \text{which } x \end{cases}$$

$$x^x = e^{x \log x} \text{ eind isol extr/typ on } \mathbb{R}_>$$

$$\frac{d}{dx} e^{x \log x} = e^{x \log x} \frac{d}{dx} x \log x = e^{x \log x} (1 + \log x) = 0 \Leftrightarrow \log x = -1 \Leftrightarrow x = 1/e$$

$$\frac{d}{dx} e^{x \log x} (1 + \log x) = (1 + \log x) \frac{d}{dx} e^{x \log x} + e^{x \log x} \frac{d}{dx} (1 + \log x)$$

$$= (1 + \log x)\, e^{x \log x} (1 + \log x) + \frac{e^{x \log x}}{x} = e^{x \log x} \underbrace{(1 + \log x)^2 + \frac{1}{x}} > 0 \Longrightarrow \text{ min}$$

$$k \in \mathbb{N} \Longrightarrow \bigvee_x^{\mathbb{R}^>} e^{-x^2} = kx$$

$$x^x\colon \quad \text{abs/rel Extr } x > 0$$