Derivace

- $\left(x^3 - \sqrt[3]{x} - \frac{2}{\sqrt{x}} - 1\right)' = \left(x^3 - x^{\frac{1}{3}} - 2x^{-\frac{1}{2}} - 1\right)' = 3x^2 - \frac{1}{3}x^{-\frac{2}{3}} - 2\cdot\left(-\frac{1}{2}x^{-\frac{3}{2}}\right) =$
  $= 3x^2 - \frac{1}{3\sqrt[3]{x^2}} + \frac{1}{\sqrt{x^3}}$

- $\left(x^2 \cdot \operatorname{cotg} x\right)' = 2x \cdot \operatorname{cotg} x + x^2 \cdot \left(-\frac{1}{\sin^2 x}\right) = x \cdot \left(2\operatorname{cotg} x - \frac{x}{\sin^2 x}\right)$

- $\left(2^x \cdot x^2\right)' = 2^x \cdot \ln 2 \cdot x^2 + 2^x \cdot 2x = 2^x \cdot x\,(x \ln 2 + 2)$

- $\left(\sqrt{x} \cdot \ln x\right)' = \frac{1}{2}x^{-\frac{1}{2}} \cdot \ln x + \sqrt{x} \cdot \frac{1}{x} = \frac{\ln x}{2\sqrt{x}} + \frac{1}{\sqrt{x}}$

  POZN: $\frac{\sqrt{x}}{x} = \frac{x^{\frac{1}{2}}}{x} = \frac{1}{x^{\frac{1}{2}}} = \frac{1}{\sqrt{x}}$

- $\left(\frac{x^3 - 2x}{x+1}\right)' = \frac{(3x^2-2)\cdot(x+1) - (x^3-2x)\cdot 1}{(x+1)^2} = \frac{3x^3 - 2x + 3x^2 - 2 - x^3 + 2x}{(x+1)^2} =$
  $= \frac{2x^3 + 3x^2 - 2}{(x+1)^2}$

- $\left(\frac{e^x}{x+e^x}\right)' = \frac{e^x \cdot (x+e^x) - e^x \cdot (1+e^x)}{(x+e^x)^2} = \frac{xe^x + e^{2x} - e^x - e^{2x}}{(x+e^x)^2} = \frac{e^x(x-1)}{(x+e^x)^2}$

- $\left(\frac{3x+5}{x^2-1}\right)' = \frac{3(x^2-1) - (3x+5)\cdot 2x}{(x^2-1)^2} = \frac{3x^2 - 3 - 6x^2 - 10x}{(x^2-1)^2} = \frac{-3x^2 - 10x - 3}{(x^2-1)^2}$

- $\left(\ln\sqrt{\sin x}\right)' = \frac{1}{\sqrt{\sin x}} \cdot \frac{1}{2}(\sin x)^{-\frac{1}{2}} \cdot \cos x = \frac{\cos x}{2\sqrt{\sin x}\,\sqrt{\sin x}} = \frac{\cos x}{2\sin x} = \frac{1}{2}\operatorname{cotg} x$

- $\left(\sqrt{x^2 - 5x + 1}\right)' = \frac{1}{2}(x^2 - 5x + 1)^{-\frac{1}{2}} \cdot (2x - 5) = \frac{2x-5}{2\sqrt{x^2 - 5x + 1}}$

- $\left(e^{4x^2-5}\right)' = e^{4x^2-5} \cdot 8x$

- $\left(\operatorname{arctg}(x-1)\right)' = \frac{1}{1+(x-1)^2} \cdot 1 = \frac{1}{1+(x-1)^2}$

- $\left(\cos^3 x^2\right)' = 3\cos^2 x^2 \cdot (-\sin x^2) \cdot 2x = -6x \cdot \cos^2 x^2 \cdot \sin x^2$

- $\left(\ln^2(x^3 - 2x)\right)' = 2\ln(x^3 - 2x) \cdot \frac{1}{x^3 - 2x} \cdot (3x^2 - 2)$

- $\left(3^{e^x - 2x + x^2}\right)' = 3^{e^x - 2x + x^2} \cdot \ln 3 \cdot (e^x - 2 + 2x)$

- $(\sin\sqrt{x})' = \cos\sqrt{x} \cdot \frac{1}{2\sqrt{x}}$
- $(\operatorname{cotg} x^4)' = \frac{-1}{\sin^2 x^4} \cdot 4x^3$
- $(2\arcsin(\ln x))' = 2 \cdot \frac{1}{\sqrt{1-\ln^2 x}} \cdot \frac{1}{x}$
- $(3^{\sqrt{x}})' = 3^{\sqrt{x}} \cdot \ln 3 \cdot \frac{1}{2\sqrt{x}}$
- $(e^{\cos x})' = e^{\cos x} \cdot (-\sin x)$
- $(\operatorname{arctg}(\sin x))' = \frac{1}{1+\sin^2 x} \cdot \cos x$
- $(\sqrt{x^3+5x})' = \frac{1}{2\sqrt{x^3+5x}} \cdot (3x^2+5)$
- $(\operatorname{tg}^2 x)' = 2\operatorname{tg} x \cdot \frac{1}{\cos^2 x}$
- $(\operatorname{tg} x^2)' = \frac{1}{\cos^2 x^2} \cdot 2x$
- $(e^{x \cdot \sin x})' = e^{x \sin x} \cdot (\sin x + x\cos x)$
- $(\sin x \cdot e^{x^2})' = \cos x \cdot e^{x^2} + \sin x \cdot e^{x^2} \cdot 2x$
- $(\ln x^2 \cdot \sin x)' = \frac{1}{x^2} \cdot 2x \cdot \sin x + \ln x^2 \cdot \cos x = \frac{2}{x}\sin x + \ln x^2 \cdot \cos x$
- $\left(\frac{\cos^2 x}{x^3+2x}\right)' = \frac{2\cos x \cdot (-\sin x) \cdot (x^3+2x) - \cos^2 x \cdot (3x^2+2)}{(x^3+2x)^2}$
- $\left(\frac{e^{x^2}}{\sin 3x}\right)' = \frac{e^{x^2} \cdot 2x \cdot \sin 3x - e^{x^2} \cdot \cos 3x \cdot 3}{(\sin 3x)^2}$
- $\left(\frac{\ln 5x}{2x^3-2}\right)' = \frac{\frac{1}{5x} \cdot 5 \cdot (2x^3-2) - \ln 5x \cdot (6x^2)}{(2x^3-2)^2}$
- $(\sqrt{\cos 4x})' = \frac{1}{2\sqrt{\cos 4x}} \cdot (-\sin 4x) \cdot 4 = \frac{-2\sin 4x}{\sqrt{\cos 4x}}$
- $\left(\ln\frac{x+1}{3x}\right)' = \frac{1}{\frac{x+1}{3x}} \cdot \frac{1 \cdot 3x - (x+1) \cdot 3}{9x^2} = \frac{3x - 3x - 3}{(x+1) \cdot 3x} = \frac{-1}{x(x+1)}$

- $\left(\operatorname{arccotg}\sqrt{x}\cdot\sin x\right)' = \frac{-1}{1+x}\cdot\frac{1}{2\sqrt{x}}\cdot\sin x + \operatorname{arccotg}\sqrt{x}\cdot\cos x$
- $\left(\operatorname{cotg}\frac{1}{x}\right)' = \frac{-1}{\sin^2\frac{1}{x}}\cdot\left(-x^{-2}\right) = \frac{1}{x^2\sin^2\frac{1}{x}}$
- $\left(\sin\sqrt[3]{x}\right)' = \cos\sqrt[3]{x}\cdot\frac{1}{3\sqrt[3]{x^2}}$
- $\left(\sqrt{\ln x}\cdot e^{3x}\right)' = \frac{1}{2\sqrt{\ln x}}\cdot\frac{1}{x}\cdot e^{3x} + \sqrt{\ln x}\cdot e^{3x}\cdot 3$
- $\left(\frac{\cos 5x}{\ln 3x}\right)' = \frac{-\sin 5x\cdot 5\cdot\ln 3x - \cos 5x\cdot\frac{1}{3x}\cdot 3}{\ln^2 3x}$
- $\left(\operatorname{tg}\frac{e^x}{x}\right)' = \frac{1}{\cos^2\frac{e^x}{x}}\cdot\frac{e^x\cdot x - e^x}{x^2}$
- $\left(\operatorname{arctg}^2 x^7\right)' = 2\operatorname{arctg}x^7\cdot\frac{1}{1+x^{14}}\cdot 7x^6$

- $\left(\ln\frac{x+1}{x-3}\right)' = \frac{1}{\frac{x+1}{x-3}}\cdot\frac{1\cdot(x-3)-(x+1)\cdot 1}{(x-3)^2} = \frac{x-3}{x+1}\cdot\frac{-4}{(x-3)^2} = \frac{-4}{(x+1)(x-3)}$
- $\left(x^3\cdot e^{x^2}\right)' = 3x^2\cdot e^{x^2} + x^3\cdot e^{x^2}\cdot 2x = 3x^2e^{x^2} + 2x^4e^{x^2}$
- $\left(\operatorname{arctg}\frac{\sqrt{x}}{2}\right)' = \frac{1}{1+\frac{x}{4}}\cdot\frac{1}{2}\cdot\frac{1}{2}x^{-\frac{1}{2}} = \frac{1}{\frac{4+x}{4}}\cdot\frac{1}{4\sqrt{x}} = \frac{4}{4+x}\cdot\frac{1}{4\sqrt{x}} =$

  $= \frac{1}{(4+x)\sqrt{x}}$
- $\left((x^2+4x+1)^3\cdot e^{x^2-1}\right)' = 3(x^2+4x+1)^2\cdot(2x+4)\cdot e^{x^2-1} + (x^2+4x+1)^3\cdot e^{x^2-1}\cdot 2x$

  $= (x^2+4x+1)^2 e^{x^2-1}\cdot\left[6x+12+2x^3+8x^2+2x\right] = (x^2+4x+1)^2\cdot e^{x^2-1}(2x^3+8x^2+8x+12)$
- $\left(\frac{x^2\cdot\sin x}{x^2-1}\right)' = \frac{(2x\cdot\sin x + x^2\cdot\cos x)\cdot(x^2-1) - x^2\sin x\cdot 2x}{(x^2-1)^2} = \frac{2x^3\sin x + x^4\cos x}{}$

  $\frac{-2x\sin x - x^2\cos x - 2x^3\sin x}{(x^2-1)^2} = \frac{x^4\cos x - 2x\sin x - x^2\cos x}{(x^2-1)^2}$
- $\left(\frac{e^x\cdot x^3}{2x-5}\right)' = \frac{(e^x\cdot x^3 + e^x\cdot 3x^2)(2x-5) - e^x x^3\cdot 2}{(2x-5)^2} = \frac{e^x\cdot x^2\left[(x+3)(2x-5)-2x\right]}{(2x-5)^2} = \frac{e^x x^2(2x^2-x-15)}{(2x-5)^2}$

- $(x\cdot e^{-x+5})' = e^{-x+5} + x\cdot e^{-x+5}(-1) = e^{-x+5}(1-x)$

- $((x^2+5x-3)\cdot e^{x^2})' = (2x+5)e^{x^2} + (x^2+5x-3)\cdot e^{x^2}\cdot 2x =$
  $= e^{x^2}(2x+5+2x^3+10x^2-6x) = e^{x^2}(2x^3+10x^2-4x+5)$

- $(\sqrt[3]{x^2}\cdot \ln x^2)' = \frac{2}{3}\cdot x^{-\frac{1}{3}}\cdot \ln x^2 + \sqrt[3]{x^2}\cdot\frac{1}{x^2}\cdot 2x =$
  $= \frac{2\ln x^2}{3\sqrt[3]{x}} + \frac{\sqrt[3]{x^2}\cdot 2}{x} = \frac{2\ln x^2}{3\cdot\sqrt[3]{x}} + \frac{2}{\sqrt[3]{x}}$

  POZN: $\frac{\sqrt[3]{x^2}}{x} = \frac{x^{\frac{2}{3}}}{x^1} = \frac{1}{x^{\frac{1}{3}}}$

- $\left(\operatorname{arctg}\frac{x-2}{x+1}\right)' = \frac{1}{1+\left(\frac{x-2}{x+1}\right)^2}\cdot\frac{1(x+1)-(x-2)\cdot 1}{(x+1)^2} =$
  $= \frac{1}{\frac{(x+1)^2+(x-2)^2}{(x+1)^2}}\cdot\frac{x+1-x+2}{(x+1)^2} = \frac{(x+1)^2\cdot 3}{[(x+1)^2+(x-2)^2]\cdot(x+1)^2} = \frac{3}{(x+1)^2+(x-2)^2}$

- $(\sqrt{x^2-5x}\cdot e^{-x})' = \frac{1}{2}(x^2-5x)^{-\frac{1}{2}}\cdot(2x-5)\cdot e^{-x} + \sqrt{x^2-5x}\cdot e^{-x}(-1) =$
  $= \frac{(2x-5)}{2\cdot\sqrt{x^2-5x}\cdot e^{x}} - \frac{\sqrt{x^2-5x}}{e^{x}}$

- $\left(\frac{(2x-4)^3}{x^2-6}\right)' = \frac{3(2x-4)^2\cdot 2\cdot(x^2-6)-(2x-4)^3\cdot 2x}{(x^2-6)^2} =$
  $= \frac{(2x-4)^2\cdot 2\cdot[3x^2-18-4x^2+8x]}{(x^2-6)^2} = \frac{(2x-4)^2\cdot 2\cdot(-x^2+8x-18)}{(x^2-6)^2}$

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

- $(\sqrt{x^2-5x+1}-x+1)' = \frac{1}{2}(x^2-5x+1)^{-\frac{1}{2}}\cdot(2x-5)-1 =$
  $= \frac{2x-5}{2\sqrt{x^2-5x+1}} - 1$

- $\left(\sqrt{\frac{3x-1}{x+2}}\right)' = \frac{1}{2}\left(\frac{3x-1}{x+2}\right)^{-\frac{1}{2}}\cdot\frac{3(x+2)-(3x-1)}{(x+2)^2} = \frac{1}{2\sqrt{\frac{3x-1}{x+2}}}\cdot\frac{3x+6-3x+1}{(x+2)^2} = \frac{\sqrt{x+2}}{2\sqrt{3x-1}}\cdot\frac{7}{(x+2)^2}$