MA 1

(a) $(x \cdot \cos x \cdot \operatorname{arctg} x)' =$ $\qquad D(f) = \mathbb{R}$

$= \cos x \operatorname{arctg} x + x \cdot (-\sin x) \cdot \operatorname{arctg} x + \dfrac{x \cdot \cos x}{1+x^2}$

(b) $(\sqrt{x^5+2})' = \left((x^5+2)^{\frac{1}{2}}\right)' = 5x^4 \cdot \frac{1}{2} \cdot (x^5+2)^{-\frac{1}{2}} = \dfrac{5x^4}{2\sqrt{x^5+2}}$

$D(f) = \langle \sqrt[5]{-2}; \infty)$

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

$D(f) = (0; \infty)$

$= \dfrac{\ln x}{x \cdot \sqrt{\ln^2 x + 1}}$

(d) $\left(\ln^2 (x^3)\right)' = 2\ln(x^3) \cdot \frac{1}{x^3} \cdot 3x^2 = \dfrac{6x^2 \ln(x^3)}{x^3}$

$D(f) = (0; \infty)$

(e) $(\ln \ln \sin x)' = \dfrac{1}{\ln \sin x} \cdot \dfrac{1}{\sin x} \cdot \cos x = \dfrac{\cos x}{\sin x \cdot \ln \sin x}$

$D(f) = \emptyset$

(f) $(x^x)' = (e^{x \cdot \ln x})' = e^{x \cdot \ln x} \cdot (\ln x + 1)$

$D(f) = (0; \infty)$

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

$D(f) = \mathbb{R} - \{3\}$

$= e^{\frac{\ln(x^2+1)}{x-3}} \cdot \dfrac{\frac{2x}{x^2+1} \cdot (x-3) - \ln(x^2+1)}{(x-3)^2} = e^{\frac{\ln(x^2+1)}{x-3}} \cdot \dfrac{\frac{2x^2-6x}{x^2+1} - \ln(x^2+1)}{(x-3)^2}$

(h) $\operatorname{arctg}^{\ln x}(1-x^2)$

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

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

$$= \cancel{e^{x^2}(6x + 4x^3)}\ 6x e^{x^2} + 4x^3 e^{x^2}$$

3) $(\sin x)' = \cos x$ $\qquad$ $(x^3)' = 3x^2$

lichá $\quad$ sudá $\quad$ lichá $\quad$ sudá

4) $(\cos x)' = -\sin x$ $\qquad$ $(x^4)' = 4x^3$

sudá $\quad$ lichá $\quad$ sudá $\quad$ lichá

5) $(2x^2 - 1)' = 4x$

tečna: $y = f(a) + f'(a) \cdot (x - a)$

normála: $x = a$ pro $f'(a) = 0$

$y = f(a) - \frac{1}{f'(a)}(x - a)$ pro $f'(a) \neq 0$

$a = -\frac{1}{2}$

$f(a) = -\frac{1}{2}$

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

$$y = -\frac{1}{2} - \frac{1}{-2}\left(x - \left(-\frac{1}{2}\right)\right) = -\frac{1}{2} + \frac{x + \frac{1}{2}}{2} =$$

$$= \frac{x - \frac{1}{2}}{2} = \underline{\underline{\frac{2x - 1}{4}}}$$

6) $(x^x)' = e^{x \ln x} \cdot (\ln x + 1)$ $\qquad$ $a =$

$f(a) =$

tečna:

normála: