

$$1) f(x) = 10$$

$$f'(x) = 0$$

$$c' = 0$$

$$2) f(x) = 10 \cdot x^{\textcircled{3}} = x^n$$

$$f'(x) = 10 \cdot 3 \cdot x^{3-1} = 30 \cdot x^2$$

$$(x^n)' = n \cdot x^{n-1}$$

$$(c \cdot f(x))' = c \cdot f'(x)$$

$$3) f(x) = \sqrt[3]{x} + 4x + 8 =$$

$$= x^{\frac{1}{3}} + 4x + 8$$

$$(f(x) + g(x))' = f'(x) + g'(x)$$

$$f'(x) = \frac{1}{3} x^{\frac{1}{3}-1} + 4 \cdot 1 \cdot x^{1-1} + 0$$

$$= \frac{1}{3} x^{-\frac{2}{3}} + 4 x^0 =$$

$$= \frac{1}{3} \frac{1}{\sqrt[3]{x^2}} + 4$$

$$(x^1)' = 1$$

$$x^{\frac{n}{q}} = \sqrt[q]{x^n}$$

$$x^{-n} = \frac{1}{x^n}$$

$$4) f(x) = \frac{2}{x^4} + \frac{1}{\sqrt[3]{x}} =$$

$$= 2 \cdot x^{-4} + x^{-\frac{1}{3}}$$

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

$$= -8 \cdot x^{-5} - \frac{1}{3} x^{-\frac{4}{3}} =$$

$$= -\frac{8}{x^5} - \frac{1}{3} \cdot \frac{1}{\sqrt[3]{x^4}}$$

$$(x \cdot y)^a = x^a \cdot y^a$$

$$(x^a)^b = x^{a \cdot b}$$

$$x^a \cdot x^b = x^{a+b}$$

$$5) f(x) = \sqrt{x \sqrt{x}} = (x \cdot x^{\frac{1}{2}})^{\frac{1}{2}}$$

$$= x^{\frac{1}{2}} \cdot (x^{\frac{1}{2}})^{\frac{1}{2}} = x^{\frac{1}{2}} \cdot x^{\frac{1}{2} \cdot \frac{1}{2}} =$$

$$= x^{\frac{1}{2} + \frac{1}{4}} = x^{\frac{3}{4}}$$

$$\text{mak!} \left(x \cdot x^{\frac{1}{2}}\right)^{\frac{1}{2}} = \left(x^{1+\frac{1}{2}}\right)^{\frac{1}{2}} = \left(x^{\frac{3}{2}}\right)^{\frac{1}{2}}$$

$$= x^{\frac{3}{2} \cdot \frac{1}{2}} = x^{\frac{3}{4}}$$

$$f'(x) = \frac{3}{4} x^{\frac{3}{4}-1} = \frac{3}{4} x^{-\frac{1}{4}} = \frac{3}{4 \sqrt[4]{x}}$$

$$6) f(x) = 2 \cdot 4^x - 3e^x$$

$$(a^x)' = a^x \ln a$$

$$(e^x)' = e^x$$

$$f'(x) = 2 \cdot 4^x \cdot \ln 4 - 3e^x$$

$$7) f(x) = \log_2 x - 5 \ln x$$

$$(\log_a x)' = \frac{1}{x \cdot \ln a}$$

$$(\ln x)' = \frac{1}{x}$$

$$n) \quad \frac{1}{x} - \frac{5}{x}$$

$$f'(x) = \frac{1}{x \ln 2} - \frac{5}{x}$$

$$8) f(x) = \underbrace{(x^2-4)}_{f(x)} \cdot \underbrace{\sin x}_{g(x)}$$

$$f'(x) = 2x \cdot \sin x + (x^2-4) \cdot \cos x$$

$$9) f(x) = \lg x = \frac{\sin x}{\cos x}$$

$$f'(x) = \frac{\cos x \cdot \cos x - \sin x (-\sin x)}{\cos^2 x} =$$

$$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = (\lg x)'$$

$$(\ln x)' = \frac{1}{x}$$

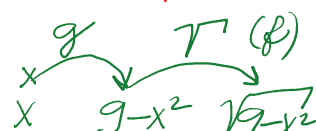
$$(f(x) \cdot g(x))' = f'(x)g(x) + f(x)g'(x)$$

$$(\sin x)' = \cos x$$

$$(\cos x)' = -\sin x$$

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$$

$$\cos^2 x + \sin^2 x = 1$$



$$10) f(x) = \sqrt{9-x^2} = (9-x^2)^{\frac{1}{2}} \quad \text{--- } f(x)$$

$$f'(x) = \frac{1}{2} \cdot (9-x^2)^{\frac{1}{2}-1} \cdot (9-x^2)'$$

$$= \frac{1}{2} (9-x^2)^{-\frac{1}{2}} \cdot (-2x) = \frac{-x}{\sqrt{9-x^2}}$$

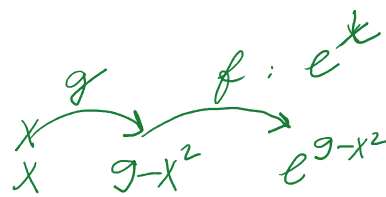
$$(f(g(x)))' = f'(g(x)) \cdot g'(x)$$

$f: (x^n)' = n \cdot x^{n-1}$

$$11) f(x) = e^{9-x^2}$$

$$f'(x) = e^{9-x^2} \cdot (9-x^2)'$$

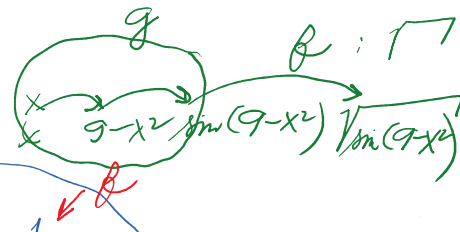
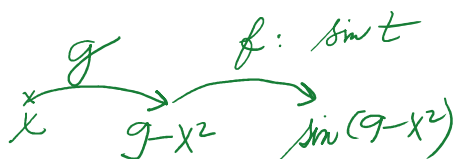
$$= e^{9-x^2} (-2x) = -2x e^{9-x^2}$$



$$12) f(x) = \sin(9-x^2)$$

$$f'(x) = \cos(9-x^2) \cdot (9-x^2)'$$

$$= -2x \cos(9-x^2)$$



$$= -2x \cos(9-x^2)$$

$$13) f(x) = \sqrt{\sin(9-x^2)} = (\sin(9-x^2))^{\frac{1}{2}}$$

$$f'(x) = \frac{1}{2} (\sin(9-x^2))^{-\frac{1}{2}} \cdot (\sin(9-x^2))' = \frac{1}{2 \sqrt{\sin(9-x^2)}} \cdot (-2x \cos(9-x^2))$$

$$14) f(x) = x^3 + 3^x + x^x$$

$$(x^3)' = 3x^2$$

$$(3^x)' = 3^x \ln 3$$

$$(x^x)' = x^x (\ln x + 1)$$

LOGARITHMICKÁ DERIVÁCIA

$$x^x = e^{\ln x^x} = e^{x \cdot \ln x}$$

$$(x^x)' = (e^{x \cdot \ln x})' = e^{x \cdot \ln x} \cdot [x \cdot \ln x]' = e^{x \cdot \ln x} [1 \cdot \ln x + x \cdot \frac{1}{x}] = e^{x \cdot \ln x} (\ln x + 1) = x^x (\ln x + 1)$$

$$f(x) = x^{\sin x} = e^{\ln x^{\sin x}} = e^{\sin x \cdot \ln x}$$

$$f'(x) = e^{\sin x \cdot \ln x} (\sin x \cdot \ln x)' = x^{\sin x} \left[\cos x \ln x + \sin x \cdot \frac{1}{x} \right]$$

$$(f \circ f^{-1})(x_0) = x_0$$

$$f \circ f^{-1} = \text{id}$$

$$\log_a x^a = a \log_a x$$

$$f: e^{\ln x}$$

$$(f(g(x)))' = f'(g(x)) \cdot g'(x)$$

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

$$f(x) = x^{\sin x} = e^{\ln x^{\sin x}} = e^{\sin x \cdot \ln x}$$

$$f'(x) = e^{\sin x \cdot \ln x} (\sin x \cdot \ln x)' = x^{\sin x} \left[\cos x \ln x + \sin x \cdot \frac{1}{x} \right]$$