$f(x) = 5x^3 - 3x^2 + 1$

$f'(x) = 15x^2 - 6x$

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

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

$f(x) = x\sin x - x^2\cos x$

$f'(x) = 1\cdot\sin x + x\cos x - \left(2x\cos x + x^2(-\sin x)\right) =$

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

$= (1 + x^2)\sin x - x\cos x$

$f(x) = \frac{x^2 - 1}{x + 2}$ $\qquad \frac{f(x)}{g(x)} = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$

$f'(x) =$

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

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

$f(x) = \sqrt{x^2 + 2x + 3}$ $\qquad [f(g(x))]' = f'(g(x))\,g'(x)$

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

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

$f(x) = \ln\left(\sin 2x + \sqrt{x}\right)$ $\qquad \frac{1}{\sin 2x + \sqrt{x}} \cdot \left(\cos 2x \cdot 2 + \frac{1}{2}x^{-\frac{1}{2}}\right)$

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

$f(x) = e^{3x^2 - \sin x}$ $\qquad f'(x) = f(x)$

$$f'(x) = e^{3x^2 - \sin x}(6x - \cos x)$$

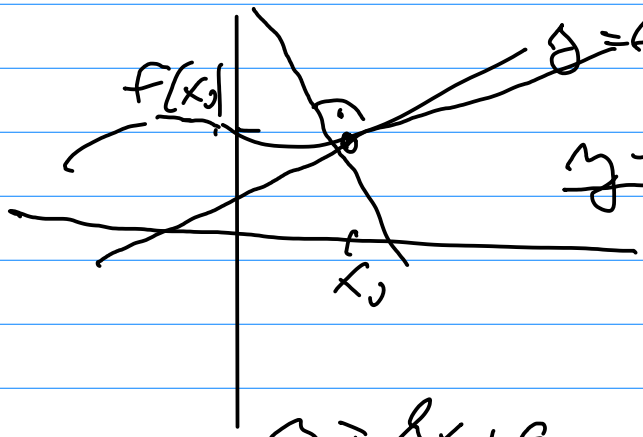
$$f(x) = \ln(\operatorname{arctg} \frac{1}{\sqrt{x}}) \qquad \frac{1}{\operatorname{arctg} \frac{1}{\sqrt{x}}} \cdot \frac{1}{1 + \left(\frac{1}{\sqrt{x}}\right)^2}$$

$$f(x) = \ln(\operatorname{arctg} x^{-\frac{1}{2}})$$

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

$$f(x) = \ln\left(\cos\left(\sqrt{e^x + 1}\right)\right) = \ln\left(\cos\left(e^x + 1\right)^{\frac{1}{2}}\right)$$

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



$y = f(x)$ $\qquad [x_0, f(x_0)]$

$y - f(x_0) = f'(x_0)(x - x_0)$

$k = f'(x_0)$

$k' = -\frac{1}{k} = -\frac{1}{f'(x_0)}$

$y = kx + q \qquad -\frac{1}{k}$

$f(x) = x^2 + 3x + 7 \qquad A = [1, ?] \qquad A = [1, 11]$

$f(1) = f(x_0) = 1 + 3 + 7 = 11 \qquad f(x_0) = 11$

$f'(x) = 2x + 3$

$f'(x_0) = f'(1) = 5 \qquad y - 11 = 5(x - 1)$

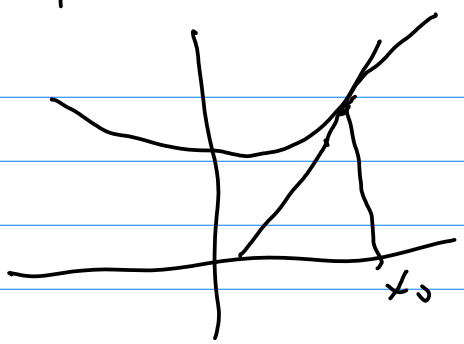
$k = 5 \qquad y = 5x + 6$

$k' = -\frac{1}{k} = -\frac{1}{5} \qquad y - 11 = -\frac{1}{5}(x - 1)$

$x = 1{,}1 \qquad f(x)$

$df(x, x_0) = f'(x_0)(x - x_0)$

$y = f(x_0) + df(x, x_0) = f(x_0) + f'(x_0)(x - x_0)$



$x = 1{,}1$

$x_0 = 1 \quad f(x_0) = 11$

$f'(x_0) = 5$

$df(x, x_0) = 5(1{,}1 - 1) =$

$= 5 \cdot 0{,}1 = 0{,}5$

$y = 11 + 5(1{,}1 - 1) = 11 + 0{,}5 = \underline{11{,}5}$

$f(1{,}1) = 1{,}1^2 + 3 \cdot 1{,}1 + 7 = 1{,}21 + 3{,}3 + 7 =$

$= \underline{11{,}51}$

1,01

$f(x) = x^3 - x + 2$

$f'(x) = 3x^2 - 1 = 2$

$3x^2 = 3$

$x^2 = 1$

$x = \pm 1$

$A_1 = [1, 2]$

$A_2 = [-1, 2]$

$p: 2x - y + 3 = 0$

$y = 2x + 3$

$k = 2$

$A_1: y - 2 = 2(x - 1) \quad y = 2x + 0$

$A_2: y - 2 = 2(x + 1) \quad y = 2x + 4$

$f(x) = e^{x^2 + 3x}$

$A = [?, 1]$

0, -3

$f(x) = 1$

$e^{x^2 + 3x} = 1 = e^0$

$x^2 + 3x = 0$

$x(x+3)=0$

$x \in \{0, -3\}$

$A_1 = [0,1]$ $y-1=3(x-0)$

$A_2 = [-3,1]$ $y-1=-3(x+3)$

$f'(x) = e^{x^2+3x}(2x+3)$

$f'(0) = e^0 \cdot 3 = 3$

$f'(-3) = e^{3^2-3\cdot 3}(2(-3)+3) = 1(-3) = -3$