№1

- $f(x) = \arctan^{1} x$

// $y = \arctan x$
$x = \tan(x)$

$\frac{dx}{dy} =$

$\tan(x) = \frac{\sin(x)}{\cos x}$

$(tg(arctg\,a))' = (a)'$

$tg'(arctg\,x) \cdot arctg'\,a = 1$

$\cos(\arccos x) = x$

$-\sin(\arccos x) \cdot \arccos' x = 1$

$\arccos x' = -\frac{1}{\sqrt{1-x^2}}$

$\arcsin x' = \frac{1}{\sqrt{1-x^2+1}}$

$w'(x)$

$w(ae^a) = a$

$w(a \cdot e^a) = a$

$f(a) = a \cdot e^a$

$w(a \cdot e^a) = a$

$w(x) = \frac{x}{e^x}$ $\quad \cancel{\frac{a \cdot e^a}{e^{a \cdot e^a}}}$

$w(ae^a) = \frac{ae^a}{e^{ae^a}}$

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

$\frac{d\,tg(x)}{dx} = \frac{1}{2}\,\frac{1}{1-\cos^2 x}$

// $\cos x = 1 - \frac{x^2}{2} + \frac{x^4}{3!} - \frac{x^6}{4!} + \dots$ //

$(\cos x)' = -x + \frac{4}{3!}x^3$ Видно $\sin x$ //

$$\frac{a^{x+\Delta x}-a^x}{\Delta x}=a^x\cdot\frac{a^{\Delta x}-1}{\Delta x}\qquad \frac{a^{\Delta x}-1}{\Delta x}$$

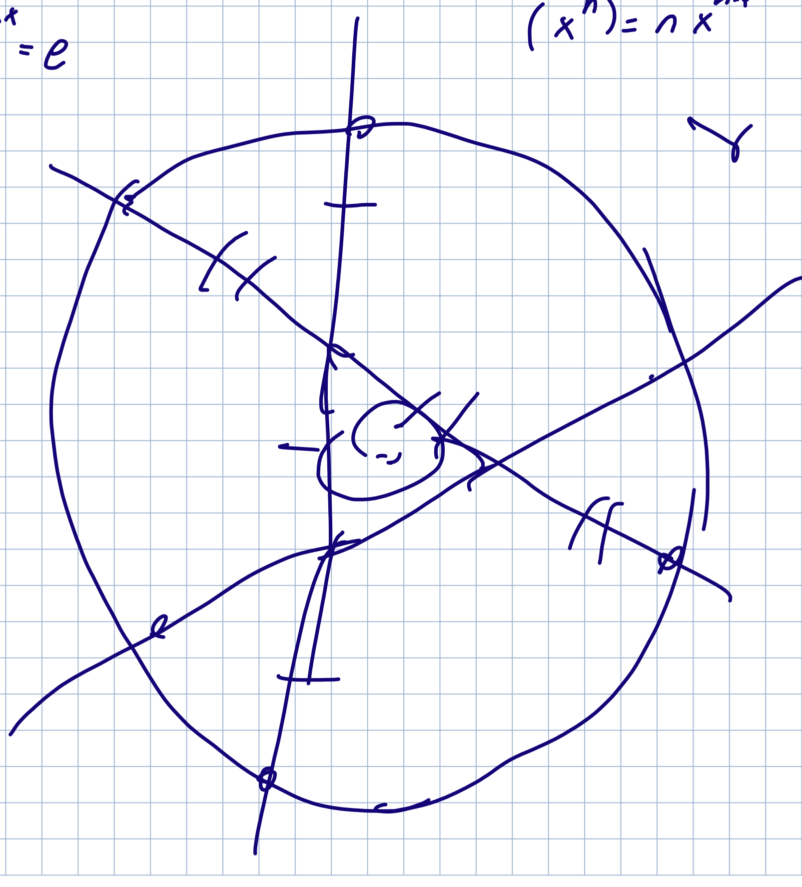
$$\frac{a^{\Delta x}-1}{\Delta x}\ \mathop{\lim} e^{\ln\frac{a^{\Delta x}-1}{\Delta x}}$$

$$\cdot\ e^{\lim\left(\ln\frac{a^{\Delta x}-1}{\Delta x}\right)}$$

$$(a^x)'=(e^{x\ln a})'=\quad e^{x\ln a}\cdot\ln a=a^x\cdot\ln a$$

$$\lim_{\Delta x\to0}\frac{e^{\Delta x\ln a}-1}{\Delta x}=\frac{\left(\left(1+\Delta x\right)^{1/\Delta x}\right)^{\Delta x\cdot\ln a}-1}{\Delta x}=\frac{(1+\Delta x)^{\ln a}-1}{\Delta x}$$

$$\lim_{\Delta x\to0}\left(1+\frac{1}{1/\Delta x}\right)^{1/\Delta x}=e\qquad (x^n)'=nx^{n-1}$$



№2

- $f(x) = \prod_{k=0}^{2019} (x-k)$ в $x_0 = 0$

$f(x) = x(x-1)(x-2)(x-3)\cdot\ldots\cdot(x-2019)$

$f(x) = x^{2020} + \ldots - 2019!\, x + \ldots$

$f'(x) = 2019\, x^{2019} + \ldots - 2019!$

$f'(0) = -2019!$

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

$\dfrac{y-y_0}{x-x_0} = f'_{x_0}$

$y = f'_{x_0}(x-x_0) + y_0$

№9

(в) $x^{\frac{x}{y^2}-1} - 2y = 0$ at point $(4;2)$

$\left(\frac{x}{y^2}-1\right)\cdot x^{\frac{x}{y^2}-2}\cdot\frac{1}{y^2}\cdot dx - 2dy = 0$

$\dfrac{\left(\frac{x}{y^2}-1\right)}{2\cdot y^2}\cdot x^{\frac{x}{y^2}-2}\cdot dx = dy$

$\dfrac{dy}{dx} = \dfrac{\left(\frac{x}{y^2}-1\right)}{2\cdot y^2}\cdot x^{\frac{x}{y^2}-2}$

$\left.\dfrac{dy}{dx}\right|_{x_0=4} = 0$

$\dfrac{d\left(x^{\frac{x}{y^2}-1}\right)}{dx} =$

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

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

$$x\, e^{\frac{x}{y^2}-1} - 2y = 0$$

$$\left(e^{\frac{x}{y^2}-1} + x \cdot e^{\frac{x}{y^2}-1} \cdot \frac{1}{y^2}\right) dx \quad - 2dy = 0$$