(27.04.20)

№7.2.1.

$y = e^{x^3}$ $\quad dy - ?$

$dy = y'_x dx = (e^{x^3})'_x dx = e^{x^3} \cdot 3x^2 dx = 3x^2 e^{x^3} dx$

№7.2.6

$y = x^2 - 3x + 1$ $\quad \Delta y,\ dy - ?$ в точке $x_0 = 2$, $\Delta x = 0,1$

1) $\Delta y = y(x + \Delta x) - y(x) = ((x + \Delta x)^2 - 3(x + \Delta x) + 1) - (x^2 - 3x + 1) =$

$= x^2 + 2x\Delta x + (\Delta x)^2 - 3x - 3\Delta x + 1 - x^2 + 3x - 1 =$

$= (2x\Delta x - 3\Delta x) + (\Delta x)^2 = (2x - 3) \cdot \Delta x + (\Delta x)^2 \Rightarrow dy = (2x-3)dx$

$dy = f'(x)dx = (x^2-3x+1)'_x\, dx = (2x-3)\,dx$

$\Delta y\big|_{\substack{x_0=2\\ \Delta x=0{,}1}} = (2x-3)\Delta x + (\Delta x)^2\Big|_{\substack{x_0=2\\ \Delta x=0{,}1}} = (2\cdot 2-3)\cdot 0{,}1 + (0{,}1)^2 = 0{,}11$

$dy\big|_{\substack{x_0=2\\ \Delta x=0{,}1}} = ((2x-3)dx)\Big|_{\substack{x_0=2\\ \Delta x=0{,}1}} = ((2x-3)\Delta x)\Big|_{\substack{x_0=2\\ \Delta x=0{,}1}} = (2\cdot 2-3)\cdot 0{,}1 = 0{,}1$

№7.2.9.

1) $\ln 1{,}02$

$f(x_0+\Delta x) \approx f(x_0) + f'(x_0)\cdot \Delta x$

$\ln 1{,}02 = \ln(1+0{,}02) = [\, x_0 = 1;\ \Delta x = 0{,}02\,] \approx \ln(1) + (\ln(1))'_x \cdot 0{,}02 =$

$= [\, (\ln x)'_x = \frac{1}{x}\,] = \ln 1 + \frac{1}{1}\cdot 0{,}02 = 0 + 1\cdot 0{,}02 = 0{,}02$

То есть $\ln 1{,}02 \approx 0{,}02$

2) $\sqrt{24} = \sqrt{25+(-1)} = [\, x_0 = 25;\ \Delta x = -1\,] \approx \sqrt{25} + (\sqrt{25})'\cdot(-1) =$

$= \sqrt{25} + \frac{1}{2\sqrt{25}}\cdot(-1) = 5 + \frac{1}{10}\cdot(-1) = 4{,}9$

№7.2.13

$y = \sqrt[3]{x}$ $\quad dy,\ d^2y,\ d^3y - ?$

$dy = y'_x\, dx = (\sqrt[3]{x})'_x\, dx = \frac{dx}{3\sqrt[3]{x^2}}$

$d^2y = d(dy) = d\left(\frac{dx}{3\sqrt[3]{x^2}}\right) = \left(\frac{1}{3\sqrt[3]{x^2}}\right)'_x d(dx) = -\frac{2\,dx^2}{9\sqrt[3]{x^5}}$

$d^3y = d(d^2x) = d\left(-\frac{2dx^2}{9x^2\sqrt{x^2}}\right) = \left(-\frac{2}{3x\sqrt[3]{x^2}}\right)'_x dx^3 =$

$= \frac{10\,dx^3}{27x^2\sqrt[3]{x^2}}$