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Интегралы и дифференциальные уравнения

Производные (повторение)

$$f'(x_0) = \lim_{\Delta x \to 0} \frac{f(x_0 + \Delta x) - f(x)}{\Delta x} \qquad (\ln y)' = \frac{y'}{y}$$

$$(u^v)' = u^v \cdot v' \ln u + u^{v-1} \cdot u' \cdot v, \qquad \frac{u(x)}{v(x)}$$

Решение задач

№ 1

$y' - ?$

$$y' = \left(11 \cdot \operatorname{arcctg}^2 \ln \frac{5x+\sqrt{x}}{12x^2-5}\right)' = 11 \cdot \left(\operatorname{arcctg}^2 \ln \frac{5x+\sqrt{x}}{12x^2-5}\right)' =$$

$$= 11 \cdot 2 \operatorname{arcctg}^{2-1} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot \left(\operatorname{arctg} \ln \frac{5x+\sqrt{x}}{12x^2-5}\right)' = 11 \cdot 2 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot \left(-\frac{1}{1+\left(\ln \frac{5x+\sqrt{x}}{12x^2-5}\right)^2}\right) \cdot \left(\ln \frac{5x+\sqrt{x}}{12x^2-5}\right)' = 11 \cdot 2 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot$$

$$\cdot \left(-\frac{1}{1+\ln^2 \frac{5x+\sqrt{x}}{12x^2-5}}\right) \cdot \frac{1}{\frac{5x+\sqrt{x}}{12x^2-5}} \cdot \left(\frac{5x+\sqrt{x}}{12x^2-5}\right)' = 11 \cdot 2 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot$$

$$\cdot \left(-\frac{1}{1+\ln^2 \frac{5x+\sqrt{x}}{12x^2-5}}\right) \cdot \frac{12x^2-5}{5x+\sqrt{x}} \cdot \frac{(5x+\sqrt{x})' \cdot (12x^2-5) - (5x+\sqrt{x})(12x^2-5)'}{(12x^2-5)^2} = n$$

$$* = \frac{\left(5+\frac{1}{2\sqrt{x}}\right)(12x^2-5) - (5x+\sqrt{x})(24x - 0)}{(12x^2-5)^2} = \frac{(5 \cdot 2\sqrt{x}+1) - 2\sqrt{x}(5x+\sqrt{x}) \cdot 24x}{2\sqrt{x}} : (12x^2-5)^2 =$$

$$= \frac{(10\sqrt{x}+1)(12x^2-5) - 2\sqrt{x} \cdot \sqrt{x} \cdot (5\sqrt{x}+1) \cdot 24x}{2\sqrt{x}(12x^2-5)^2} =$$

$$= \frac{(10\sqrt{x}+1)(12x^2-5) - 48x^2(5\sqrt{x}+1)}{2\sqrt{x}(12x^2-5)^2}$$

$$n = -22 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot \frac{1}{1+\ln^2 \frac{5x+\sqrt{x}}{12x^2-5}} \cdot \frac{(12x^2-5)(10\sqrt{x}+1)(12x^2-5) -}{(5x+\sqrt{x}) \cdot 2\sqrt{x} \cdot}$$

$$\frac{-48x^2(5\sqrt{x}+1))}{(12x^2-5)^2} = -22 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot \frac{1}{1+\ln^2 \frac{5x+\sqrt{x}}{12x^2-5}} \cdot$$

$$\cdot \frac{(10\sqrt{x}+1)(12x^2-5)-48x^2(5\sqrt{x}+1)}{2x(5\sqrt{x}+1)(12x^2-5)} = -11 \cdot \operatorname{arcctg} \ln \frac{5x+\sqrt{x}}{12x^2-5} \cdot$$

$$\cdot \frac{1}{1+\ln^2 \frac{5x+\sqrt{x}}{12x^2-5}} \cdot \frac{(10\sqrt{x}+1)(12x^2-5)-48x^2(5\sqrt{x}+1)}{((5\sqrt{x})+1)(12x^2-5)x}$$

№ 2

$$y' - ? \qquad y=(x^2-\sqrt{11x})^{\arcsin(x^2-1)}$$

$$(\ln y)' = \frac{y'}{y}$$

$$\ln y = \ln(x^3-\sqrt{11x})^{\arcsin(x^2-1)}$$

$$(\ln y)' = (\arcsin(x^2-1)\cdot\ln(x^3-\sqrt{11x}))' = \frac{2x}{\sqrt{1-(x^2-1)^2}}\cdot\ln(x^3-\sqrt{11x}) +$$

$$+\arcsin(x^2-1)\cdot\frac{1}{x^3-\sqrt{11x}}\cdot\left(3x^2-\frac{\sqrt{11}}{2\sqrt{x}}\right) \Rightarrow y' = y\cdot * = (x^3-\sqrt{11x})^{\arcsin(x^2-1)}\cdot *$$