

Lesson 18. Preparation to control work

1. Find using the definition of the derivative:

$$y = \frac{x-1}{2x}, \quad y' = ?$$

Calculate (№№ 2 – 9):

$$2. \quad y = \sqrt{x^3} - 3x^2 \ln 4 + \operatorname{arcctg}(5y), \quad y'_x = ?$$

$$3. \quad y = (\ln x + 4)^{\sin 3x}, \quad dy = ? \quad 4. \quad y = \frac{e^{-9x^2}}{\arccos 4x}, \quad \frac{dy}{dx} = ?$$

$$5. \quad y = \operatorname{arctg} \lg \frac{1}{x+1}, \quad y'(4) = ?$$

$$6. \quad y = 3 \ln^4 \left(\frac{x}{2} + 1 \right), \quad \frac{d^2y}{dx^2} = ?$$

$$7. \quad y = (\sin(x^2 - 4x)) \operatorname{tg}^2(3x + y), \quad y' = ?$$

$$8. \quad z = \ln(\sqrt[3]{x^4} + 3^{5y}), \quad dz = ?$$

$$9. \quad u = 3^{x+y}, \quad x = \cos t, \quad y = 3t^2, \quad \frac{du}{dt} = ? \quad \text{Do not substitute } x \text{ and } y \text{ in the } u \text{ function.}$$

Calculate using L'Hôpital's Rule (№№ 10 – 11)

$$10. \quad \lim_{x \rightarrow +\infty} \frac{2^{3x}}{x^2}.$$

$$11. \quad \lim_{x \rightarrow 0} x^{\sin 5x}.$$

12. Find the equations of the tangent and normal to the curve

$$\begin{cases} x = 5 \sin t, \\ y = 2e^{\cos^2 t}. \end{cases} \quad \text{in the point, where } t = \frac{\pi}{6}.$$