

Find the derivatives of these functions.

$$1. y = \ln(x(x^4 + 5)^3)$$

$$2. y = \ln((x^2 + 1)^3(x + 5)^5)$$

$$3. y = \ln\left(\frac{(x^3 + 1)^2}{(x^4 + 5)^3}\right)$$

$$4. y = \ln\left(\frac{(3x + 5)^5(x + 3)^4}{(2x + 1)^3}\right)$$

$$5. y = \ln(x^3 e^{3x^2+5})$$

$$6. y = \ln\left(\frac{x^2 + 1}{e^{3x^3+4}}\right)$$

$$7. y = \frac{e^{x^2+4x}}{e^{4x+5}}$$

$$8. y = \frac{(x + 7)^5}{(x^4 + 7)^3}$$

$$9. y = (x^4 + 9)^{10} \sqrt{x^2 + 6}$$

$$10. y = \frac{(x^2 + 3)^4(x^3 - 7)^3}{(7 - 2x)^2}$$

$$4. y = 5 \ln(3x + 5) + 4 \ln(x + 3) - 3 \ln(2x + 1)$$

$$y' = 5 * \frac{3}{3x + 5} + 4 * \frac{1}{x + 3} - 3 * \frac{2}{2x + 1}$$

$$y' = \frac{15}{3x + 5} + \frac{4}{x + 3} - \frac{6}{2x + 1}$$

$$5. y = \ln(x^3) + \ln(e^{3x^2+5})$$

$$y = 3 \ln(x) + 3x^2 + 5$$

$$y' = \frac{3}{x} + 6x$$

$$6. y = \ln(x^2 + 1) - \ln(e^{3x^3+4})$$

$$y = \ln(x^2 + 1) - (3x^3 + 4)$$

$$y' = \frac{2x}{x^2 + 1} - 9x^2$$

$$7. y = e^{(x^2+4x)-(4x+5)}$$

$$y = e^{x^2-5}$$

$$y' = 2xe^{x^2-5}$$

$$8. \ln y = \ln\left(\frac{(x + 7)^5}{(x^4 + 7)^3}\right)$$

$$\ln y = 5 \ln(x + 7) - \ln(x^4 + 7)^3$$

$$\ln y = 5 \ln(x + 7) - 3 \ln(x^4 + 7)$$

$$\frac{y'}{y} = \frac{5}{x + 7} - \frac{12x^3}{x^4 + 7}$$

$$y' = y * \left(\frac{5}{x + 7} - \frac{12x^3}{x^4 + 7}\right)$$

$$y' = \frac{(x + 7)^5}{(x^4 + 7)^3} * \left(\frac{5}{x + 7} - \frac{12x^3}{x^4 + 7}\right)$$

$$9. \ln(y) = \ln((x^4 + 9)^{10} \sqrt{x^2 + 6})$$

$$\ln(y) = 10 \ln(x^4 + 9) + \frac{1}{2} \ln(x^2 + 6)$$

$$\frac{y'}{y} = \frac{40x^3}{x^4 + 9} + \frac{1}{2} * \frac{2x}{x^2 + 6}$$

$$y' = y * \left(\frac{40x^3}{x^4 + 9} + \frac{x}{x^2 + 6}\right)$$

$$y' = (x^4 + 9)^{10} \sqrt{x^2 + 6} * \left(\frac{40x^3}{x^4 + 9} + \frac{x}{x^2 + 6}\right)$$

$$10. \ln(y) = 4 \ln(x^2 + 3) + 3 \ln(x^3 - 7) - 2 \ln(7 - 2x)$$

$$\frac{y'}{y} = \frac{8x}{x^2 + 3} + \frac{9x^2}{x^3 - 7} - \frac{-4}{7 - 2x}$$

$$y' = y * \left(\frac{8x}{x^2 + 3} + \frac{9x^2}{x^3 - 7} + \frac{4}{7 - 2x}\right)$$

$$y' = \frac{(x^2 + 3)^4(x^3 - 7)^3}{(7 - 2x)^2} * \left(\frac{8x}{x^2 + 3} + \frac{9x^2}{x^3 - 7} + \frac{4}{7 - 2x}\right)$$

Solutions

$$1. y = \ln(x) + 3 \ln(x^4 + 5)$$

$$y' = \frac{1}{x} + 3 * \frac{4x^3}{x^4 + 5}$$

$$y' = \frac{1}{x} + \frac{12x^3}{x^4 + 5}$$

$$2. y = 3 \ln(x^2 + 1) + 5 \ln(x + 5)$$

$$y' = 3 * \frac{2x}{x^2 + 1} + 5 * \frac{1}{x + 5}$$

$$y' = \frac{6x}{x^2 + 1} + \frac{5}{x + 5}$$

$$3. y = 2 \ln(x^3 + 1) - 3 \ln(x^4 + 5)$$

$$y' = 2 * \frac{3x^2}{x^3 + 1} - 3 * \frac{4x^3}{x^4 + 5}$$

$$y' = \frac{6x^2}{x^3 + 1} - \frac{12x^3}{x^4 + 5}$$