

Derivatives of Exponential and Logarithmic Functions

In 1 – 20, find $\frac{dy}{dx}$.

1. $y = e^{-x}$

11. $y = \frac{5e^x}{3e^x + 1}$

2. $y = x^2 e^x$

12. $y = 4^x - 5 \log_9 x$

3. $y = \frac{e^x - 1}{e^x + 1}$

13. $y = (1 - 3x)^{\cos x}$

4. $y = \ln\left(\frac{x}{3x - 4}\right)$

14. $y = \frac{x^{\frac{3}{4}} \sqrt{x^2 + 1}}{(3x + 2)^5}$

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

15. $y = 3 \log_7(x^2 + 1)$

6. $y = \ln(3x - 4)^2$

16. $y = \ln(2x^3 - x)^2$

7. $y = \ln \sec x$

17. $y = \frac{\ln 2x}{e^{2x} + 2}$

8. $y = \ln \frac{2}{x}$

18. $y = (2e^{x^2} + x^2)^3$

9. $y = \sqrt[5]{\ln 5x}$

19. $y = e^{-x} \sin x$

10. $y = \log_3(\ln x)$

20. $y = \pi^{x^3} + \ln e^{\sqrt{x}}$

21. Write the equation of the line tangent to

a) $y = \frac{1}{2}e^{3x}$ at $x = \frac{1}{2}$

b) $y = 2 \ln x$ at $x = 4$

c) $y = \frac{x}{e} \ln\left(\frac{e}{x}\right)$ at $x = e$

22. If $f(x) = e^x \ln x$, find the value of $f'(e)$.

23. If $y = \ln(3x + 5)$, find $\frac{d^2y}{dx^2}$.

24. Let f be the function defined by $f(x) = \ln(3x + 2)^k$ for some positive constant k . If $f'(2) = 3$, what is the value of k ?

25. Suppose that the percentage of alcohol in the bloodstream t hours after consumption is given by $C(t) = 0.2te^{-\frac{t}{2}}$. What is the maximum level of alcohol in the bloodstream (to the nearest tenth of a percent) and when does it occur?