

REVIEW LOGARITHMS AND EXPONENTIALS
CALCULUS AB - HARTER

Solve each for x.

- $\ln(2x+1) = 2$
- $\log_4(x) + \log_4(x-6) = 2$
- $\log_3(2x-1) - \log_3(x+1) = -1$
- $e^{3x-1} = 3$

Simplify.

- $\ln 3 + \ln 2 - \ln 5$
- Write $\log_6 x$ in terms of the natural log.
- $\log 100 - 3\log_9 27 - 2\log_3 \sqrt[3]{3}$

Find the derivative of each.

- $\frac{d}{dx} [\log_4 3x^2]$
- $\frac{d}{dx} [e^{2x+2}]$
- $\frac{d}{dx} [\ln |\cos 6x|]$
- $\frac{d}{dx} [3^{-2x-3}]$
- $\frac{d}{dx} \left(\ln \frac{3x\sqrt{x-2}}{\sin x} \right)$
- $\frac{d}{dx} [4^x]$
- $\frac{d}{dx} [x^3 \cdot 5^{2x}]$
- $\frac{d}{dx} \left[\frac{e^{3x}}{x^3} \right]$
- $\frac{d}{dx} [\ln(\cos x + \sin x)]$

17. Use logarithmic differentiation to find the derivative

$$\text{of } f(x) = \frac{\sqrt{4x-1}}{(2x+1)^3}.$$

- Find the equation of the tangent line at $x=2$ for $f(x) = x \ln x$.
- Find the 2nd derivative of $f(x) = 3e^{3x^2}$.
- Find the equation of the tangent line for $y = \log_2 x$ when $x=8$.

IMPLICIT DIFFERENTIATION Find dy/dx .

- $\ln(xy) + 3x^2 - 2y = 0$
- $e^{2y} + e^{2x} - 2x^2 = 5$
- $\ln y + \sin y - 3x^2 = 0$

Find the integral of each.

- $\int_0^{\ln 3} \frac{e^x}{e^x + 2} dx$

- $\int \frac{2}{3-6x} dx$

- $\int \frac{dx}{x(\ln x)^2}$

- $\int \frac{6x^2}{1+6x^3} dx$

- $\int 3^{2x} dx$

- $\int \frac{x^2 + 4x + 1}{x^2 + 1} dx$

- $\int \frac{x^3 + 2x^2 + 2}{x^2 + 1} dx$

- $\int_1^e \frac{\ln x}{x} dx$

- $\int_2^3 \frac{x+2}{x-1} dx$

- $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$

- $\int_{-1}^2 2^{2x} dx$

- $\int \frac{3x^2 - 2}{x} dx$

- $\int \frac{x^2 - 1}{x + 2} dx$

37. Use logarithmic differentiation to find y' for $y = x^x$

38. Find the relative extrema for the function

$$f(x) = xe^x. \text{ Label as a maximum or a minimum.}$$

Justify your answer.

39. Find $f^{-1}'(2)$ if $f(x) = \sqrt{x-5}$.

40. At what point(s) does $f^{-1}'(x)$ have an

$$\text{instantaneous slope of } 1/25 \text{ if } f(x) = x^3 - 2x + 6.$$

Know your Trig integrals and derivatives!!!!

Answers

1. $\frac{e^2 - 1}{2}$
2. 8
3. $\frac{4}{5}$
4. $\frac{1 + \ln 3}{3}$
5. $\ln 6/5$
6. $\ln x / \ln 6$
7. $-19/6$
8. $\frac{2}{x \ln 4}$
9. $2e^{2x+2}$
10. $-6 \tan 6x$
11. $-2 \cdot \ln 3 \cdot 3^{-2x-3}$
12. $\frac{1}{x} + \frac{1}{2(x-2)} - \cot x$
13. $\ln 4 \cdot 4^x$
14. $5^{2x} \cdot x^2 (2x \ln 5 + 3)$
15. $\frac{3e^{3x}(x-1)}{x^4}$
16. $\frac{\cos x - \sin x}{\cos x + \sin x}$
17. $\frac{-20x + 8}{\sqrt{4x-1}(2x+1)^4}$
18. $y - \ln 4 = (1 + \ln 2)(x - 2)$
19. $6e^{3x^2}(1 + 6x^2)$
20. $y - 3 = \frac{1}{\ln 256}(x - 8)$
21. $\frac{dy}{dx} = \frac{6x^2y + y}{2xy - x}$
22. $\frac{dy}{dx} = \frac{2x - e^{2x}}{e^{2y}}$
23. $\frac{dy}{dx} = \frac{6xy}{1 + y \cos y}$
24. $\ln 5/3$
25. $-\frac{1}{3} \ln |3 - 6x| + c$
26. $-\frac{1}{\ln x} + c$
27. $\frac{1}{3} \ln |1 + 6x^3| + c$
28. $\frac{1}{2} \cdot \frac{1}{\ln 3} \cdot 3^{2x} + c$
29. $x + 2 \ln(x^2 + 1) + C$
30. $\frac{1}{2}x^2 + 2x - \frac{1}{2} \ln(x^2 + 1) + C$
31. $\frac{1}{2}$
32. $\ln 8 + 1$
33. $\ln |e^x + e^{-x}| + C$
34. $\frac{63}{4 \ln 4}$
35. $\frac{3}{2}x^2 - 2 \ln |x| + c$
36. $\frac{1}{2}x^2 - 2x + 3 \ln |x + 2| + c$
37. $x^x(1 + \ln x)$
38. $\left(-1, -\frac{1}{e}\right)$ is a relative minimum.
39. 4
40. $(27, 3), (-15, -3)$