

ws – Logs and the derivative of the natural log

Graph each.

1. $y = \log_3 x$

2. $y = e^x$

Simplify:

3. $\log_3 \frac{1}{27} - \log 100 - \ln e^2$

4. $\log_2 \frac{1}{128} - \log_4 1 - 2 \log_4 \sqrt[3]{2}$

Solve.

5. $\ln x = -2$

7. $\log_3 x - \log_3 (x-3) = -1$

6. $\log_3 (2x-3) = 4$

8. $\log_4 x + \log_4 (3x+3) = \log_4 (x+1)$

Solve. Round to 3 decimal places.

9. $\log_3 12.56$

11. $22^{3x-1} = 7^x$ (use the graphing calculator!)

10. $3^{2x+3} = 5$

12. $500 = 240e^{2x+3}$

Find the derivative of each.

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

17. $g(x) = \ln \sqrt[3]{\frac{2x-1}{x+1}}$

14. $y = \ln(\cos x)$

18. $f(x) = \ln(\ln x^3)$

15. $y = \ln\left(\frac{\sin x}{\sin x - 1}\right)$

19. $h(x) = x^2 \cdot \ln x^5$

16. $y = \frac{\ln(2x)}{x}$

Locate any relative extrema. Label as min or max.

20. $f(x) = x \ln x - 3x$

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

22. $y = \frac{x}{\ln x}$

23. If $f(x) = \frac{\ln x}{1+x^2}$, find $f'(1)$.

Use implicit differentiation to find dy/dx .

24. $x - y = \ln(xy) - 2$

26. $2xy - x \ln x = 7$

25. $y = \ln(x^2 + y^2)$

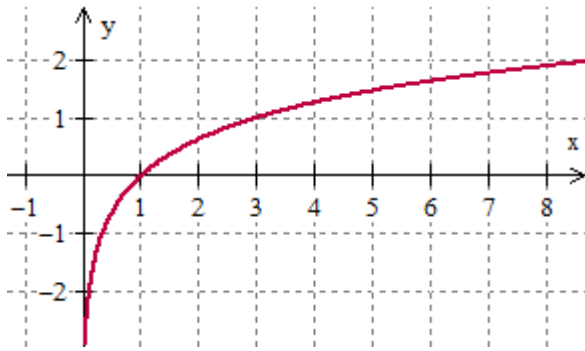
27. Find the equation the tangent line for $y^2 + \ln(xy) = 2$ at $(e, 1)$.

Use logarithmic differentiation to find dy/dx .

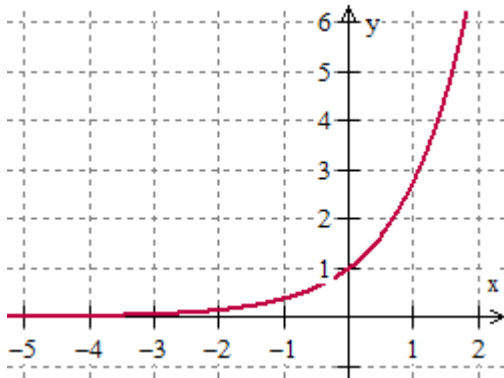
28. $y = \sqrt[3]{\frac{x^3-1}{x^3+1}}$

29. $y = \frac{(2x-1)^4}{\sqrt{4x+1}}$

Answers



1.



2.

3. -7

4. $-22/3$

5. $1/e^2$

6. 42

7. no solution!

8. $1/3$ only

9. 2.303

10. -0.768

11. 0.422

12. -1.133

$$13. y' = 3 \frac{(\ln x)^2}{x}$$

$$14. y' = -\tan x$$

$$15. y' = \cot x + \frac{\cos x}{1 - \sin x}$$

$$16. y' = \frac{1 - \ln(2x)}{x^2}$$

$$17. y' = \frac{1}{(x+1)(2x-1)}$$

$$18. y' = \frac{1}{x \ln x}$$

$$19. y' = 10x \ln x + 5x$$

20. Rel min at $(e^2, -e^2)$

21. rel min at $(-1, \ln 2)$

22. rel min at (e, e)

23. $1/2$

$$24. \frac{dy}{dx} = \frac{xy - y}{xy + x}$$

$$25. \frac{dy}{dx} = \frac{2x}{x^2 + y^2 - 2y}$$

$$26. \frac{dy}{dx} = \frac{\ln x + 1 - 2y}{2x}$$

$$27. y - 1 = \frac{-1}{3e}(x - e)$$

$$28. y' = \frac{2x^2}{(x^3 - 1)^{2/3} (x^3 + 1)^{4/3}}$$

$$29. \frac{dy}{dx} = \frac{2(14x+5)(2x-1)^3}{(4x+1)^{3/2}}$$