

## Logarithmic Functions

In problems 1-4, write the logarithmic equation as an exponential equation, or vice versa

1. $\ln 5 = 1.6094\dots$	2. $\ln 0.4 = -0.9162\dots$
3. $e^5 = 148.4131\dots$	4. $e^{-4} = 0.0183\dots$

In problems 5-9, graph the function

5. $f(x) = \ln(3-x)$	6. $f(x) = \ln(x+4)$
7. $f(x) = \ln(x^2 - 2x)$	8. $f(x) = 3 + \ln(x-1)$
9. $f(x) = -\ln(-x-2)$	

In problems 10-12, apply the inverse properties of logarithmic and exponential functions to simplify the expression

10. $\ln e^{8x+3}$	11. $e^{\ln(3x-4)}$
12. $5 + \ln e^{9x}$	

In problems 13-17, use the properties of logarithms to rewrite the expression as a sum, difference, or multiple of logarithms

13. $\ln\left(\frac{x^2 y}{z}\right)$	14. $\ln\sqrt{4x-1}$
15. $\ln\sqrt[5]{\frac{x-3}{x+5}}$	16. $\ln(x^2\sqrt{x+7})$
17. $\ln\frac{5x(x-7)^2}{(x+3)^2}$	

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In problems 18-22, use the properties of logarithms to rewrite the expression as the logarithm of a single quantity

18. $\ln(x+3) - \ln(x-5)$	19. $8\ln x - 2\ln y - 3\ln z$
20. $\frac{1}{3}[4\ln x - 5\ln y]$	21. $8[\ln x + \ln(x-7) - 2\ln(x+3)]$
22. $\frac{5}{2}[\ln x(x^2-1) - \ln(x+1)]$	

In problems 23-33, solve the equation

23. $e^{x-7} = 2$	24. $5e^{3x} = 25$
25. $5e^{x-2} - 1 = 4$	26. $400e^{-0.5x+1} = 200$
27. $\ln(x+2) = 3$	28. $4\ln(x-7) = 8$
29. $3\ln x - 2 = 4$	30. $\ln x - \ln(x-3) = 2$
31. $4^{x-1} = 5$	32. $200(1.03)^x = 800$
33. $\left(1 + \frac{0.02}{4}\right)^{4t} = 5$	

34. \$10,000 is invested at rate  $r$  compounded continuously, find the time required to double and triple when  $r = 0.025$