Exponents and Logarithms … Set 4

Learning Targets:

A. Write and apply continuous growth/decay models

B. Sketch the graphs of exponential functions

C. Solve equations using exponents

D. Evaluate and approximate logarithms

E. Sketch the graphs of logarithmic functions

F. Simplify expressions or solve equations usingpproperties of logs

G. Solve exponential equations using logarithms

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True or false (write the entire word)
For the expression $\log_b a = p$

1. _____ The value of a must be positive.
2. _____ The value of b must be positive.
3. _____ The value of p must be positive.

4. Write $8^2 = 16$ in logarithmic form.

5. Write $\log 100 = 2$ in exponential form.

Evaluate each of the following.

6. $2\log_4 2 + \log_8 2$

7. $\log_5 80 - 2\log_5 4$

8. $\log_3 3^4$

9. $10^{2\log 5}$

10. $\ln e^5$

11. $2^{\log_3 9}$

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Answers

1. True
2. True
3. False
4. $\log_8 16 = 2$
5. $10^2 = 100$
6. $\frac{4}{3}$
7. 1
8. 4
9. 25
10. 5
11. 4

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Express the following as a single logarithm (condense).

12. $\frac{2}{3}\log 27 + \log x + \log x$

13. $\frac{1}{3}(\ln x - 2\ln y)$

Expand each logarithm completely.

14. $\ln\frac{2x}{5}$

15. $\log_3\left(7x^2\right)$

Solve each of the following for x.

16. $\log_x 27 = 3$

17. $\log_9 3 = x$

18. $2^{x+3} = \frac{1}{16}$

19. $2\log_2 x - \log_2(x+3) = 2$

20. $\log_5\left(x^2 - 24x\right) = 2$

21. $\log_6(x-3) + \log_6(x+2) = 1$

22. $\ln(x+3) - \ln(x+5) = \ln\left(\frac{7}{8}\right)$

23. $\log_3(2x+1) + \log_3(x-2) = \log_3 18$

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Answers

12. $\log\left(9x^2\right)$

13. $\ln\left(\sqrt[3]{\frac{x}{y^2}}\right)$

14. $\ln 2 + \ln x - \ln 5$

15. $\log_3 7 + 2\log_3 x$

16. $x = 3$

17. $x = \frac{1}{2}$

18. $x = -7$

19. $x = \cancel{-2}, 6$

20. $x = -1,\ 25$

21. $r = \cancel{-3}, 4$

22. $x = 11$

23. $x = \cancel{-\frac{5}{2}}, 4$

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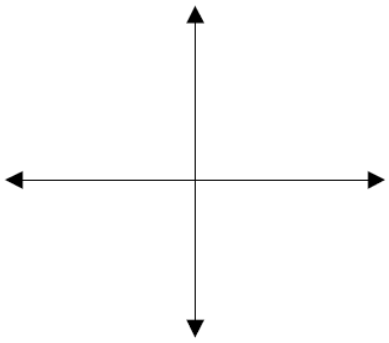
Sketch the graph of each. State two points and the asymptote.

24. Graph $y = \log_{\frac{1}{3}}(x+3)$

point: _____

additional point: _____

asymptote:_____

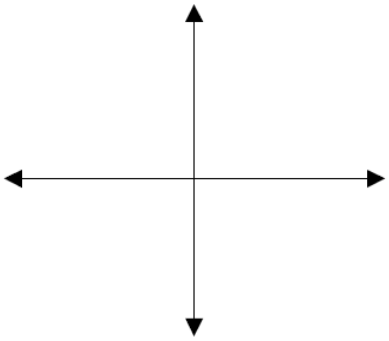


25. Graph $y = \ln(x-2)$

point: _____

additional point: _____

asymptote:_____

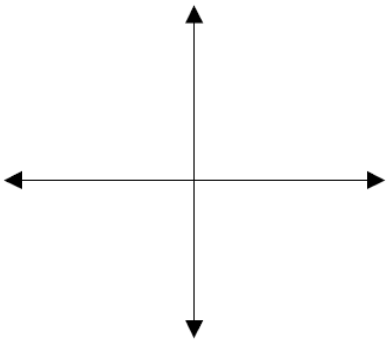


26. Graph $y = \left(\frac{3}{4}\right)^{x-1} + 2$

point: _____

additional point: _____

asymptote:_____

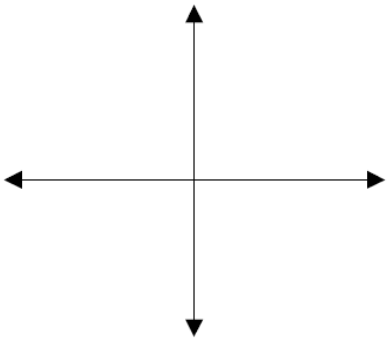


27. Graph $y = e^{x+1} - 5$

point: _____

additional point: _____

asymptote:_____



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Answers

24. $(-2, 0)$; $(0, -1)$; $x = -3$

25. $(3, 0)$; $(4.7, 1)$; $x = 2$

26. $\left(0, \frac{10}{3}\right)$; $(1, 3)$; $y = 2$

27. $(0, -2.3)$; $(-1, -4)$; $y = -5$

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Solve each of the following for x. Write answers in exact form and rounded to four decimal places.

28. $\log_{x+1} 25 = 2$

29. $x = \log_3 117$

30. $6e^{4x} = 72$

31. $6^x = 65$

32. $2500 = 1250e^{.07x}$

33. $2^{5x-1} = 7^x$

34. $\log_2(-7) = x$

35. $32.5 = e^x$

36. $\ln 1.8 = \ln e^{0.03x}$

37. $\ln 12 - \ln x = 4$

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Answers

28. $x = 4$, ~~-6~~

29. $x = \dfrac{\log 117}{\log 3} \approx 4.3347$

30. $x = \dfrac{\ln 12}{4} \approx 0.6212$

31. $x = \dfrac{\log 65}{\log 6} \approx 2.3298$

32. $x = \dfrac{\ln 2}{0.07} \approx 9.9021$

33. $x = \dfrac{\log 2}{\log\left(\dfrac{32}{7}\right)} \approx 0.4561$

34. $\varnothing$

35. $x = \ln 32.5 \approx 3.4812$

36. $x = \dfrac{\ln 1.8}{0.03} \approx 19.5929$

37. $x = \dfrac{12}{e^4} \approx 0.2198$

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38. If \$450 is deposited into an account paying $4\frac{3}{4}\%$ interest compounded quarterly, how long will it take for the investment to reach \$2000? Use logarithms and round to two decimal places.

39. There are currently 1000 micrograms of bacteria in a petri dish, if the bacteria grows at a rate of .365 micrograms per day, how many micrograms were initially in the dish 2 weeks ago?

40. A particular strain of bacteria grows from 2 bacteria to 500 bacteria in 3 hours. Find k.
Useful formula: $F = Pe^{kt}$ Round the answer to four decimal places.

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Answers

38. $t \approx 31.59$ *years*

39. 6.04 *bacteria*

40. $k \approx 1.8405$