

2 Review Exponents & Logarithms

Name: KEY

Date: _____

Period: _____

ID: 1

Unit 9 Equations Any other equations not listed will be given in the application problem.	Exponential Growth or Decay $y = ab^x$	Compounding Interest $A = Pe^{rt}$ or $A = P(1 + \frac{r}{n})^n$
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Part 1 - ~~Review~~ Under each function, write "yes" if it is an exponential function. If the answer is "no", write an explanation why not.

a) $y = 3x^5$

no, not $y = a \cdot b^x$

b) $y = -2(\frac{3}{2})^x$

yes

2. Tell whether the equation represents an exponential growth or exponential decay function.

a) $y = -0.5(\frac{3}{2})^x$ growth

b) $y = -3(e)^{-x}$ decay

3. Rewrite $\log_6 \frac{1}{4} = -\frac{1}{2}$ in exponential form.

$16 = \frac{1}{4}$

4. Rewrite $3^{-4} = \frac{1}{81}$ in logarithmic form.

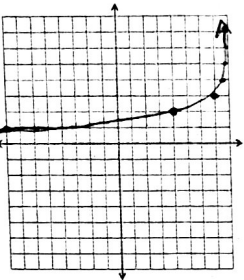
$\log_3 \frac{1}{81} = -4$

5. Evaluate $\log_6 6$

$\frac{1}{2}$

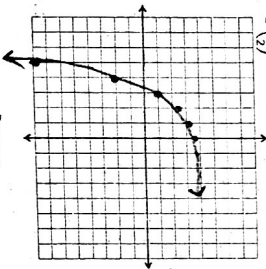
For 6-7, sketch the graph of each exponential function by doing the following: Sketch the asymptote, label at least two distinct coordinate points on each graph, and write the domain and range of each function.

6. $y = -4(7)^{x+2} + 8$



Domain: $(-\infty, \infty)$
Range: $(-\infty, 8)$

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



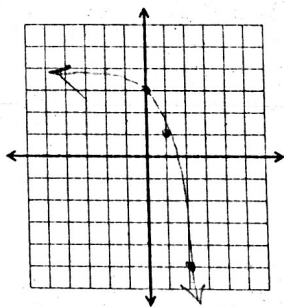
Domain: $(-\infty, \infty)$
Range: $(-\infty, 4)$

8. Sketch the graph of the given function by doing the following: Sketch the asymptote, label at least two distinct coordinate points, and write the domain and range.

$f(x) = \log_3(x+4)$

Domain: $(-4, \infty)$

Range: $(-\infty, \infty)$



9. Simplify $\frac{e^x}{(e^{2x})^{-3}}$. Your answer should contain only positive exponents.

$e \cdot (e^{2x})^3 = e^{6x+1}$

10. Expand $\ln \frac{x}{\sqrt{y}}$

$\ln x - \frac{1}{2} \ln y$

11. Condense to a single logarithm: $2 \log a + \frac{1}{3} \log b - \log c$

$\log a^2 + \log b^{1/3} - \log c = \log \left(\frac{a^2 b^{1/3}}{c} \right)$

Part 2 - #12-21 Graphing calculator is allowed.

12. Give the percent increase or percent decrease for each equation.

a) $y = 3(1.13)^x$

13% increase

b) $y = 0.3(0.938)^x$

6.2% decrease

13. Use a calculator to approximate $\log_2 9$ to three decimal places. Show your work by using the change-of-base formula.

$\frac{\log 9}{\log 2} = 3.170$

For 14-16, solve each equation. If necessary, round answers to three decimal places.

14. $5 + \log_2 a = 3$

$\log_2 a = -2$

$2^{-2} = a$

$\frac{1}{4} = a$

15. $-4 \log_6(9x) - 7 = -23$

$-4 \log_6(9x) = -16$

$\log_6 9x = 4$

$6^4 = 9x$

$1296 = 9x$

$144 = x$

16. $7 \cdot 9^{2p-4} + 3 = 45$

$7 \cdot 9^{2p-4} = 42$

$9^{2p-4} = 6$

$\log_9 6 = 2p-4$

$0.81546 = 2p-4$

$4.81546 = 2p$

$2.408 = p$

Application—show all work to earn full credit!

17. Dennis just inherited \$10,000 from a distant relative who passed away. After spending \$2,000 on new tank-tops, he puts the rest into a savings account that earns 4.5% interest compounded monthly. How much money will he have after 5 years?

$$A = 8000 \left(1 + \frac{.045}{12}\right)^{12 \cdot 5}$$

$$= \underline{\underline{\$10014.37}}$$

18. The value of a new car purchased for \$20,000 decreases by 10% per year. Write an exponential decay model for the value of the car. Use the model to estimate the value after 4 years.

$$y = 20000(.90)^x$$

$$y = 20000(.90)^4$$

$$y = \underline{\underline{\$7748.41}}$$

19. Audrey just won the mega-millions lottery! She decided to take a lump sum payment of \$250 million dollars. While thinking about what to do with the money, she wondered how much she could earn from the interest each year if it was all put into a savings account that compounded continuously. She found an account that would pay 2.25% interest. How much interest will she gain after one year?

$$A = 250e^{.0225(1)}$$

$$A = 255.6887585 \text{ mil.}$$

interest: $\underline{\underline{\$5,688,758.54}}$

20. The magnitude of an earthquake can be modeled by $M = 0.29(\ln E) - 9.9$ where E is the amount of energy released (in ergs). During Mr. Bean's senior year in high school, he woke up to an earthquake that released 8.18×10^{22} ergs. Mr. Bean's skis actually fell off the wall and he thought there was a monster truck outside his bedroom window...seriously...it was scary! What was the magnitude of this earthquake?

$$M = .29(\ln(8.18 \times 10^{22})) - 9.9$$

$$\text{Magnitude} = \underline{\underline{5.4}}$$

21. The decibel level of a sound is given by $D = 10 \log_{10} \frac{I}{10^{-12}}$ where I is the intensity of the sound measured in watts per square meter.

a) What is the decibel level of a police siren if the sound intensity is 3.162×10^{-2} watts per square meter?

$$D = 10 \log \left(\frac{3.162 \times 10^{-2}}{10^{-12}} \right) = \underline{\underline{105.0}}$$

b) If an NBA arena has a decibel level (dB) of 120. What is the sound intensity? How many times greater is that sound than a police siren (from part a)?

$$120 = 10 \log \left(\frac{I}{10^{-12}} \right)$$

$$12 = \log \left(\frac{I}{10^{-12}} \right)$$

$$10^{12} = \frac{I}{10^{-12}}$$

$$I = 1 \text{ watt/m}^2$$

$$31.63 \text{ times louder}$$