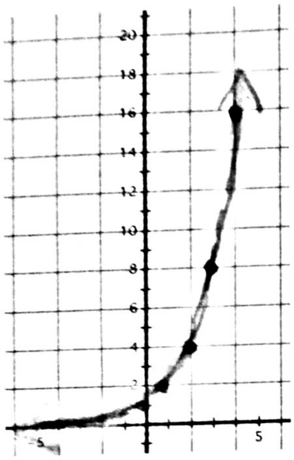
READY, SET, GO! Name Period Date

READY

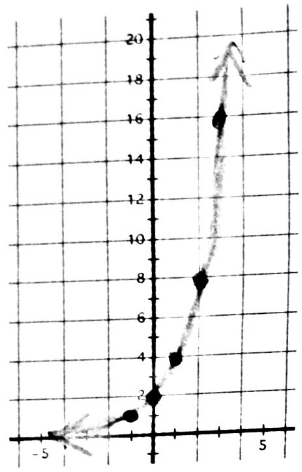
Topic: Graphing exponential equations

Graph each function over the domain $\{-4 \le x \le 4\}$.

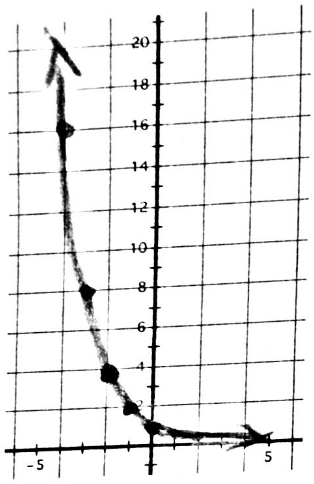
1. $y = 2^x$



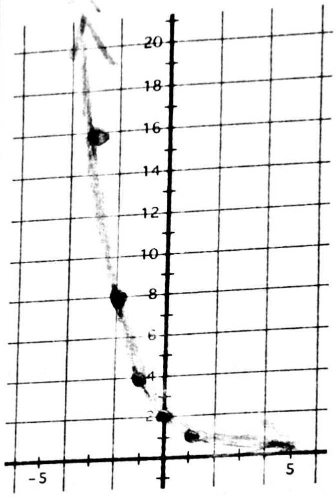
2. $y = 2 \cdot 2^x$



3. $y = \left(\frac{1}{2}\right)^x$



4. $y = 2\left(\frac{1}{2}\right)^x$



5. Compare graph #1 to graph #2. Multiplying by 2 should generate a dilation of the graph, but the graph looks like it has been translated ~~vertically~~ horizontally. How do you explain that?

·All of the output values are double so they appear higher on the graph (dilation)
·But $2 \cdot 2^x = 2^{x+1}$ ∴ Graph is also a horizontal translation

6. Compare graph #3 to graph #4. Is your explanation in #5 still valid for these two graphs? Explain. Yes

$2\left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-1} \cdot \left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{x-1}$ ∴ Horizontal translation
·But also double all of the output values so dilation

SET

Topic: Writing the logarithmic form of an exponential equation.

Definition of Logarithm: *For all positive numbers a, where $a \neq 1$, and all positive numbers x,*

$$y = \log_a x \text{ means the same as } x = a^y.$$

*(Note the **base** of the exponent and the **base** of the logarithm are both **a**.)*

7. Why is it important that in the definition of logarithm it is stated that the base of the logarithm does not equal 1? A base of 1 raised to any power is 1. Therefore, $y=\log_1$ would have infinite solutions & would not be a function.

8. Why is it important that the definition of a logarithm states that the base of the logarithm is positive? Exponential functions cannot have negative bases because they would alternate between positive values (even exponents) & negative values (odd exponents)

9. Why is it necessary that the definition states that x in the expression $\log_a x$ is positive?
A positive base raised to a power cannot equal a negative values

Write the following exponential equations in logarithmic form.

Exponential form	Logarithmic form	Exponential form	Logarithmic form
10. $5^4 = 625$	$\log_5 625 = 4$	11. $3^2 = 9$	$\log_3 9 = 2$
12. $\left(\frac{1}{2}\right)^{-3} = 8$	$\log_{\frac{1}{2}} 8 = -3$	13. $4^{-2} = \frac{1}{16}$	$\log_4 \frac{1}{16} = -2$
14. $10^4 = 10000$	$\log_{10} 10000 = 4$	15. $a^y = x$	$\log_a x = y$

16. Compare the exponential form of an equation to the logarithmic form of an equation. What part of the exponential equation is the **answer** to the logarithmic equation?
The exponent

Topic: Considering values of logarithmic functions

Answer the following questions. If yes, give an example of the answer. If no, explain why not.

17. Is it possible for a logarithm to equal a negative number? Yes ~ ex. $\log_{\frac{1}{2}} 8 = -3$

18. Is it possible for a logarithm to equal zero? Yes ~ ex. $\log_5 1 = 0$

19. Does $\log_x 0$ have an answer? No ~ a positive base raised to a power cannot $= 0$

20. Does $\log_x 1$ have an answer? Yes ~ $\log_x 1 = 0$ because $x^0 = 1$

21. Does $\log_x x^5$ have an answer? Yes ~ $\log_x x^5 = 5$ because $x^5 = x^5$

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GO

Topic: Reviewing properties of Exponents

Write each expression as an integer or a simple fraction.

22. 27^0
$= 1$

23. $11(-6)^0$
$= 11 \cdot 1$
$= 11$

24. -3^{-2}
$= -\frac{1}{3^2} = -\frac{1}{9}$

25. 4^{-3}
$= \frac{1}{4^3} = \frac{1}{64}$

26. $\frac{9}{2^{-1}}$
$= 9 \cdot 2^1 = 18$

27. $\frac{4^3}{8^0}$
$= \frac{64}{1} = 64$

28. $3\left(\frac{29^3}{11^5}\right)^0$
$= 3 \cdot 1 = 3$

29. $\frac{3}{6^{-1}}$
$= 3 \cdot 6^1 = 18$

30. $\frac{32^{-1}}{4^{-1}}$
$= \frac{4}{32} = \frac{1}{8}$

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