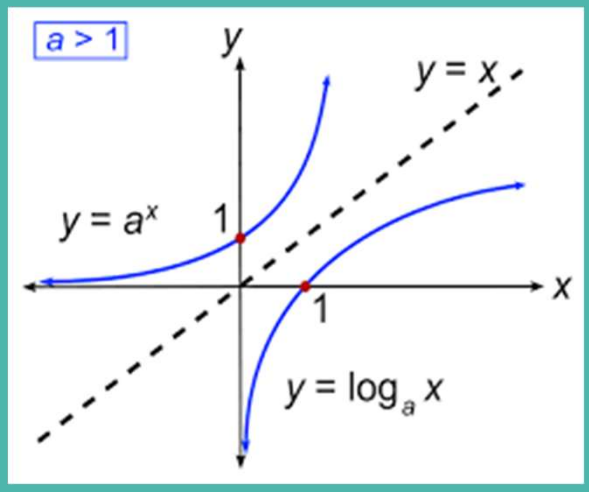
Day 2 (8/27/25)

Lesson 1

Section 1.3: Exponential and Logarithmic Functions



3

$x^y = a \Leftrightarrow y = \log_x(a)$ $x^a x^b = x^{a+b}$ $\frac{x^a}{x^b} = x^{a-b}$

~~Day 2 (8/27/25)~~

Change of base formulas

e^x inverses

Take 5 mins and write down as many facts as you can about exponential and/or logarithmic equations/rules.

$(x^a)^b = x^{ab}$ $x^0 = 1$ $x = x$

$\log(a) + \log(b) = \log(ab)$ $\log_{10}(\frac{1}{10}) = 1$ inverses

$\log(a) - \log(b) = \log(\frac{a}{b})$ $10^{\log(10)} = 10$

$x\log(a) = \log(a^x)$ True for all log no matter the base

4

Blooket | Question Set - Answer Key

Name _____
Date _____
Class _____

Exponential Rules

1. What is the simplified version of $5^3 \times 5^6$?

$5^3 \, x \, 5^6$

a) 5^9 ✔
b) 5^{18}
c) 5^{-3}
d) 5^3

2. $10^2 \, x \, 10^4$

a) 10^8
b) 10^6 ✔
c) $\frac{(10 \, x \, 10)}{(10 \, x \, 10 \, x \, 10 \, x \, 10)}$
d) $(10 \, x \, 10) \, x \, (10 \, x \, 10 \, x \, 10 \, x \, 10)$ ✔

3. $10^3 \times 10^8$

a) 10^{11} ✔
b) 10^{24}
c) 10 x 10 x 10
d) $\frac{1}{10 \, x \, 10 \, x \, 10 \, x \, 10 \, x \, 10}$

4. $9^3 \, x \, 9^5$

a) 9^8 ✔
b) 9^{15}
c) $(9 \, x \, 9 \, x \, 9)$
d) $\frac{(9 \, x \, 9 \, x \, 9)}{(9 \, x \, 9 \, x \, 9 \, x \, 9 \, x \, 9)}$

5. When you use the product rule, you

a) add the powers ✔
b) subtract the powers

6. $5^4 \div 5^1$

a) 5^4
b) $\frac{5 \, x \, 5 \, x \, 5 \, x \, 5}{5}$ ✔
c) 5^1
d) 5^3 ✔

7. $7^9 \div 7^4$

a) 7^5 ✔

b) $7^{2.25}$

c) $\frac{7 \times 7 \times 7 \times 7}{7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7}$

d) $\frac{7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7}{7 \times 7 \times 7 \times 7 \times 7}$ ✔

8. $8^4 \div 8^7$

a) 8^3

b) 8^{11}

c) 8^{-3} ✔

d) $\frac{8 \times 8 \times 8 \times 8}{8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8}$ ✔

9. $8^6 \div 8^{10}$

a) 8^{14}

b) 8^{-4} ✔

c) 8^4

d) 8^{-14}

10. When you use the quotient rule, you

a) add the powers

b) subtract the powers ✔

11. Which one is equal to the given negative exponent?

$10^{-5} =$

a) 10^5

b) $\frac{1}{10^5}$ ✔

12. Which one is equal to the given negative exponent?

$9^{-4} =$

a) $\frac{1}{9^4}$ ✔

b) 9^4

13. Which one is equal to the given negative exponent?

7^{-11}

a) 7^{11}

b) $\frac{1}{7^{11}}$ ✔

14. $10^4 \ x \ 10^{-6}$

a) 10^2

b) 10^{-2} ✔

c) $\frac{(10 \ x \ 10 \ x \ 10 \ x \ 10)}{(10 \ x \ 10 \ x \ 10 \ x \ 10 \ x \ 10 \ x \ 10)}$ ✔

d) $\frac{(10 \ x \ 10 \ x \ 10 \ x \ 10 \ x \ 10 \ x \ 10)}{(10 \ x \ 10 \ x \ 10 \ x \ 10)}$

15. $9^6 \ x \ 9^{-3}$

a) 9^3 ✔

b) 9^{-3}

c) $\frac{(9 \ x \ 9 \ x \ 9 \ )}{(9 \ x \ 9 \ x \ 9 \ x \ 9 \ x \ 9 \ x \ 9)}$

d) $\frac{(9 \ x \ 9 \ x \ 9 \ x \ 9 \ x \ 9 \ x \ 9)}{(9 \ x \ 9 \ x \ 9)}$ ✔

16. $7^4 \ x \ 7^{-3}$

a) 7^1 ✔

b) 7^{-1}

c) $\frac{(7 \ x \ 7 \ x \ 7 \ )}{(7 \ x \ 7 \ x \ 7 \ x \ 7)}$

d) $\frac{(7 \ x \ 7 \ x \ 7 \ x \ 7)}{(7 \ x \ 7 \ x \ 7)}$ ✔

17. $10^{12} \div 10^{-7}$

a) 10^{17}

b) 10^{-5}

c) 10^{19} ✔

d) 10^{-17}

18. $10^3 \ x \ 10^{-5}$

a) 10^8

b) 10^2

c) $\frac{(10 \ x \ 10 \ x \ 10)}{(10 \ x \ 10 \ x \ 10 \ x \ 10 \ x \ 10)}$ ✔

d) 10^{-2} ✔

19. $\frac{10^4}{10^{-9}}$

a) 10^{13} ✔

b) 10^{-5}

c) 10^{-13}

d) 10^5

20. $\frac{5^7}{5^{-2}}$

a) 5^5
b) 5^{-5}
c) 5^{-9}
d) 5^9 ✔

21. $\frac{3^{-4}}{3^{-9}}$

a) 3^{-5}
b) 3^5 ✔
c) 3^{13}
d) 3^{-13}

22. $\frac{7^{-2}}{7^{-3}}$

a) 7^{-1}
b) 7^4
c) 7^1 ✔
d) 7^{-4}

23. $\frac{12^{-6}}{12^{-2}}$

a) 12^{-4} ✔
b) 12^8
c) 12^4
d) 12^3

24. $\frac{6^{-5}}{6^{-8}}$

a) 6^{13}
b) 6^{-3}
c) 6^{-13}
d) 6^3 ✔

25. What is the simplified version of the expression shown?

$\frac{6^{10}}{6^7}$

a) 6^{-3}
b) 6^{70}
c) 6^{17}
d) 6^3 ✔

26. What is the simplified version of the expression shown?

$8^2 \, x \, 8^{-9}$

a) 8^7

b) 8^{-7} ✔

c) 8^{-18}

d) 8^{-11}

27. What is the simplified version of the expression shown?

$\frac{7^3}{7^{-5}}$

a) 7^{-8}

b) 8^7

c) 7^8 ✔

d) 8^{-2}

28. What is the simplified version of the expression shown?

$\frac{9^{-4}}{9^{-6}}$

a) 9^{-2}

b) 2^9

c) 9^{-10}

d) 9^2 ✔

29. What is the simplified version of the expression shown?

$\frac{10^{-8}}{10^{-3}}$

a) 10^{-11}

b) 10^{-5} ✔

c) 10^5

d) 5^{10}

Day 2 (8/27/25)

Exponent Rules/Laws

cuemath
THE MATH EXPERT

Product Rule	$a^m \times a^n = a^{m+n}$
Quotient Rule	$a^m \div a^n = a^{m-n}$
Power of a Power Rule	$(a^m)^n = a^{mn}$
Power of a Product Rule	$(ab)^m = a^m b^m$
Power of a Quotient Rule	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
Zero Exponent Rule	$a^0 = 1$
Negative Exponent Rule	$a^{-m} = \frac{1}{a^m}$
Fractional Exponent Rule	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$

6

Blooket | Question Set - Answer Key

Name _____
Date _____
Class _____

Logarithmic properties

1. Match the logarithmic property that matches the following:

$\log_b\left(\frac{x}{y}\right)$

a) $y \log_b x$
b) 1
c) $\log_b x - \log_b y$ ✔
d) $\log_b x + \log_b y$

2. Match the logarithmic property that matches the following:

$\log_b b =$

a) 1 ✔
b) 0
c) $\log_b x - \log_b y$
d) $y \ \log_b x$

3. Match the logarithmic property that matches the following:

$\log_b(xy)$

a) $\log_b x + \log_b y$ ✔
b) $\log_b x - \log_b y$
c) $\log_b\left(\frac{x}{y}\right)$
d) $y \ \log_b x$

4. Match the logarithmic property that matches the following:

$\log_b\left(x^y\right)$

a) $\log(xy)$
b) $y \cdot \log_b \ x$ ✔
c) 0
d) $\log_b x - \log_b y$

5. EXPAND the following logarithmic expression

$\log_2\left(x^3 y\right)$

a) $\log_2 x^3 + \log_2 y$
b) $3 \log_2 x + \log_2 y$ ✔
c) $3 \log_2 x - \log_2 y$
d) $x \log_2 3 + \log_y$

6. CONDENSE the following logarithmic expression

$2\log x - \log 5$

a) $\log(2x5)$

b) $\log\left(x^2 5\right)$

c) $\log\left(\frac{x^2}{5}\right)$ ✔

d) $\log\left(\frac{x}{5}\right)$

7. EXPAND the following exponential expression

$\log_3\left(\frac{6}{y^2}\right)$

a) $\log_3 6 + \log_3 y^2$

b) $\log_3 6 + 2\log_3 y$

c) $\log_3 6 - \log_3 y^2$

d) $\log_3 6 - 2\log_3 y$ ✔

8. Which is the change of base formula?

a) $\log_b y = \frac{\log b}{\log y}$

b) $\log_b y = \log b + \log y$

c) $\log_b y = \frac{\log y}{\log b}$ ✔

d) $\log_b y = \log b - \log y$

9. CONDENSE the following expression

$2\log x + 4\log y$

a) $\log(4x2y)$

b) $\log\left(x^2 y^4\right)$ ✔

c) $\log\left(\frac{x^2}{y^4}\right)$

d) $8\log\left(\frac{x}{y}\right)$

10. Rewrite the following in log form

$2^x = 5$

a) $\log_2 x = 5$

b) $\log_x 2 = 5$

c) $\log_5 2 = x$

d) $\log_2 5 = x$ ✔

Day 2 (8/27/25)

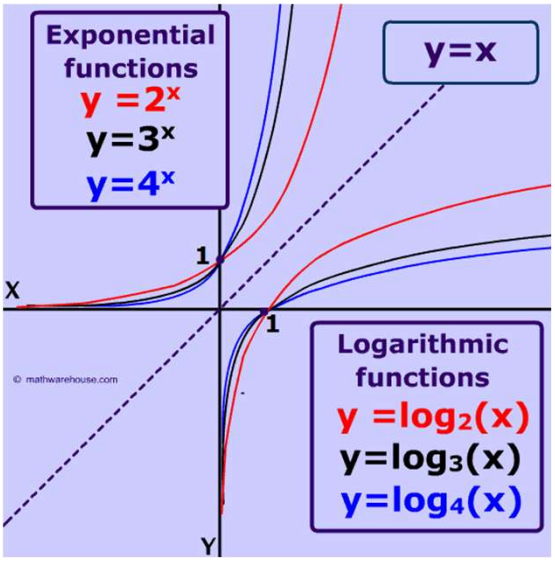
Rule of Logarithms

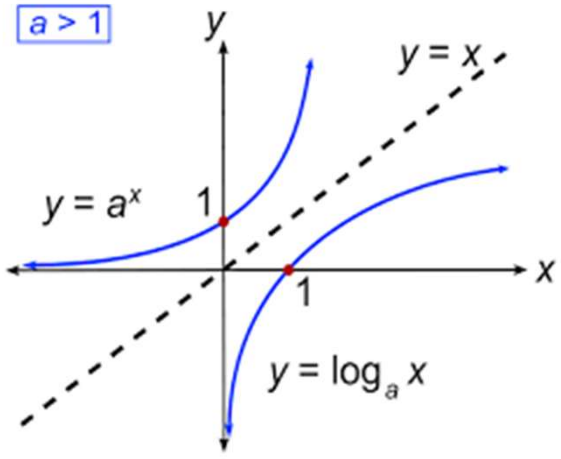
cuemath THE MATH EXPERT

Rule Name	Property
Log of 1	$\log_b 1 = 0$
Log of the same number as base	$\log_b b = 1$
Product Rule	$\log_b(mn) = \log_b m + \log_b n$
Quotient Rule	$\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$
Power Rule	$\log_b m^n = n \log_b m$
Change of Base Rule	$\log_a b = \frac{\log_c b}{\log_c a}$ (OR) $\log_a b \cdot \log_c a = \log_c b$
Equality Rule	$\log_b a = \log_b c \Rightarrow a = c$
Number Raised to Log	$b^{\log_b x} = x$
Other Rules	$\log_{b^n} a^m = \frac{m}{n} \log_b a$ $-\log_b a = \log_b \frac{1}{a}$ (OR) $= \log_{\frac{1}{b}} a$

8

Day 2 (8/27/25)





10

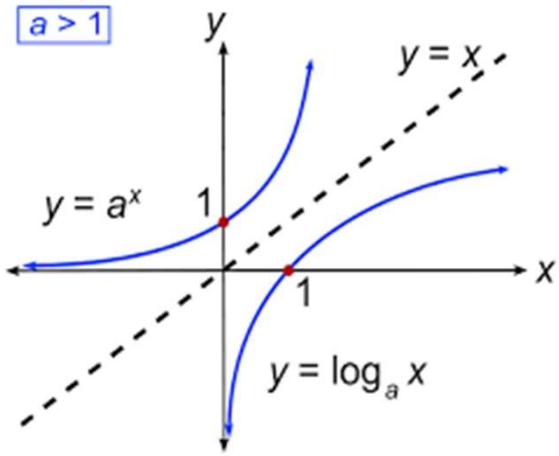
Day 2 (8/27/25)

Domain of $y = a^x$ when $a > 1$:
$(-\infty, \infty)$

Range of $y = a^x$ when $a > 1$:
$(0, \infty)$

Domain of $y = \log_a x$ when $a > 1$:
$(0, \infty)$

Range of $y = \log_a x$ when $a > 1$:
$(-\infty, \infty)$



12

Day 2 (8/27/25)

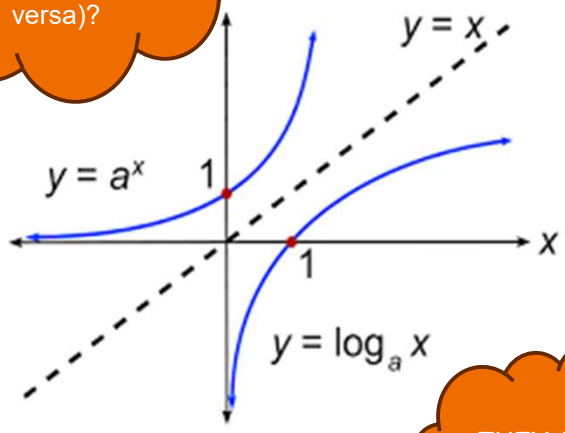
Domain of $y = a^x$ when $a > 1$:
$(-\infty, \infty)$

Range of $y = a^x$ when $a > 1$:
$(0, \infty)$

Domain of $y = \log_a x$ when $a > 1$:
$(0, \infty)$

Range of $y = \log_a x$ when $a > 1$:
$(-\infty, \infty)$

Why are the domain of the exponential and the range of the logarithmic the same (and vice versa)?



THEY ARE INVERSES!!!

15