

Section 5.1: Exponents

Essential Question:

Things to remember...

Zero Power $m^0 = 1$

Exponent Laws

1) $m^x \cdot m^y = m^{x+y}$ 2) $\frac{m^x}{m^y} = m^{x-y}, \quad m \neq 0$

3) If $m \neq 0, 1, \text{ or } -1$, then $m^x = m^y$
if and only if $x = y$

Same Exponent Laws

4) $(am)^x = a^x \cdot m^x$ 5) $\left(\frac{a}{m}\right)^x = \frac{a^x}{m^x}, \quad m \neq 0$

6) If $x \neq 0$, $a > 0$ and $m > 0$, then $a^x = m^x$ if $a = m$

Power of a Power

7) $(m^x)^y = m^{xy}$

Negative Power

8) $m^{-x} = \frac{1}{m^x}$ 9) $\frac{1}{m^{-x}} = m^x$

An expression is simplified when it does not contain negative exponents or power of powers.

Examples

1) 8^{-1} 2) $\left(\frac{2}{3}\right)^{-2}$

3) $4 \cdot 3^{-2}$ 4) $(2^{-1} \cdot 4^{-1})^{-1}$

5) $(2^{-1} + 4^{-1})^{-1}$

6) $\left(\frac{12}{6}\right)^3$

7) $\frac{8^n \cdot 3^n}{4^n}$

8) $x^{-3}(x^5 + x^3)$

9) $\frac{3a^3 \cdot 6a^6}{a^{-1}}$

10) $\frac{3a^3 - 6a^6}{a^{-1}}$

Section 5.1 Summary:

Section 5.2: Growth and Decay Functions
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Essential Question:

Model for GROWTH

A(t) =

A₀ =

r =

Model for DECAY

A(t) =

t =

Examples

1. Jeans at a department store increase at a rate of 8% per year. The current price of jeans is \$25. What will be the cost of jeans four years from now?

2. You bought a boat for \$9800 three years ago and have decided to upgrade to a newer boat. To make your new purchase you put down the money you make from the sale of the old boat. The bank informed you that boats decrease about 20% per year. How much money do you expect to get from your boat sale?

3. A train ticket costs \$275 on average. The annual rate of increase is 18%. What will be the average rate in 10 years?

4. Sam purchased a motorcycle for \$7500 eight years ago and now plans to sell it. The annual rate of decrease for a motorcycle is approximately 21% depending on the condition. How much should Sam sell his motorcycle for?

RATIONAL EXPONENTS

$$c^{m/n} =$$

Examples

5. $4^{\frac{1}{2}}$

6. $4^{-3/2}$

7. $-9^{1/2}$

8. $\left(3^{1/2} \cdot 5^{1/2}\right)^2$

9. $\left(3^{1/2} + 5^{1/2}\right)^2$

10. $\frac{x^{1/3}}{2x^{-2/3}}$

Solve

11. $3^{2x} = 3^{12}$

12. $9^x = 3^5$

13. $x^{2/3} = 9$

14. $x^{-1/2} = 4$

Section 5.2 Summary:

Section 5.3 & 5.4: Exponential Functions

Essential Question:

Exponential Functions

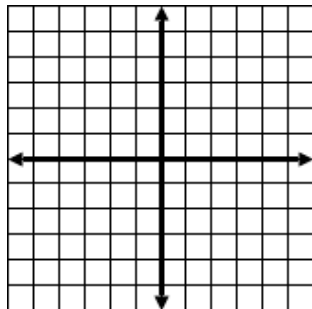
$f(x) = ab^x$ where $a > 0$

Growth if ...
 $b > 1$

Decay if ...
 $0 < b < 1$

Example 1 $y = 2^x$

a =
b =

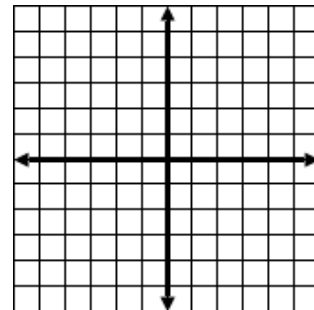


Use/Purpose: _____

Asymptote: _____

Example 2 $y = 3(\frac{1}{2})^x$

a =
b =

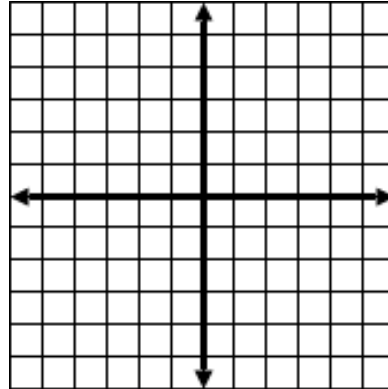


Use/Purpose: _____

The Number e

e is called the _____ number after Swiss mathematician Leonard Euler (1700's)
 $e \approx$ _____

Graph $y = e^x$



Use/Purpose:

Compound Interest *Continuously*

$$A = Pe^{rt}$$

$$A =$$

$$P =$$

$$r =$$

$$t =$$

Example

Jack and Diane are going to start a CollegeSure CD (certificate of deposit) at their bank for their newborn daughter. The particular CD they opened pays a continuous rate of 6.5% and requires a minimum deposit of \$2500.

If Jack and Diane's daughter begins college at the age of 18, how much money will she have earned from the CD when she goes to college?

Section 5.3/5.4 Summary:

Section 5.5: Logarithmic Functions

Essential Question:

A log is an exponent

If $b^x = y$ then... $\log_b y = x$
(exponential form) (log form)

Exp. Form

$$2^3 = 8$$

$$5^{-2} = 1/25$$

Log Form

$$\log_3 81 = 4$$

Common Logarithms

-Base _____

-Written as $\log x = y$ means $10^y = x$

Natural Logarithms

-Base _____

-Written as $\ln x = y$ means $e^y = x$

Examples

Solve for x.

1) $\log 10 = x$

2) $\ln e^2 = x$

3) $\ln e = x$

Short Cut... $\log_a a^b = \underline{\hspace{2cm}}$

If the bases are the same, then the answer is the _____.

Examples

4) $\log_2 16$

5) $\log 1000$

6) $\log_7 1$

7) $\log_2 2^{11}$

8) $\log_{49} 7$

9) $\log .1$

Examples #10 – 12 use a calculator

10) $\log 14$

11) $\log 250$

12) $\ln 4$

Exponential and Logarithmic Equations are **INVERSES**

Ex 13

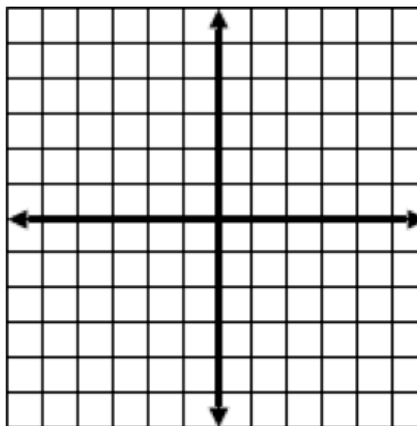
Graph $y = 2^x$ and its inverse.

$f(x)$

$f^{-1}(x)$

x y

x y



D:

D:

R:

R:

Asymptote:

Asymptote:

Examples

Solve without a calculator. Leave answers in terms of e.

14) $\log x = 2$

15) $\log |x| = 4$

16) $\ln x = 3$

Solve using a calculator.

17) $\log x = 2.3$

Section 5.5 Summary:

Section 5.6: Laws of Logarithms

Essential Question:

Given M and N are positive real numbers, $b > 0$ and $b \neq 1$

1) $\log_b MN = \log_b M + \log_b N$

2) $\log_b (M/N) = \log_b M - \log_b N$

3) $\log_b M = \log_b N$ if $M = N$ (drop the logs)

4) $\log_b M^k = k \log_b M$
(power goes to the front)

Examples

Express in terms of $\log(M)$ and $\log(N)$.

1) $\log M^3$

2) $\log(3MN)$

3) $\log \sqrt{MN}$

Examples

Express as a single logarithm or a rational number.

4) $\log_5 2 + \log_5 7$

5) $\ln e^5$

6) $\log_6 12 + \log_6 3$

7) $\log C - 3 \log W$

Examples

Express y in terms of x.

8) $\log y = 3 \log x$

9) $\ln y = \frac{1}{3}(\ln 7 + \ln x)$

Solve for the value of x.

10) $\log_2(x + 3) + \log_2 6 = 4$

11) $\log_2 x + \log_2(x - 2) = 3$

Solve the following logarithms.

12) $\log_2 8$

13) $\log_2 7$

Section 5.6 Summary: