

4.2 Logarithmic Functions

GOALS:

1. Understand the Logarithmic Function as the inverse of the Exponential Function.
2. Understand that logarithms are exponents.
3. Convert from exponential to logarithmic form and from logarithmic to exponential form.
4. Evaluate logarithms of numerals.

Study 4.2 CVC #1-15; #1 - 43; 81 - 99, 117

 inverseFunctionsBase2.mp4

 Inverse Function Video

Class Notes: Prof. G. Battaly, Westchester Community College, NY

 College Algebra & Trig Home Page

 Homework

4.2 Logarithmic Functions

Start with a one-to-one function, a function that passes both the vertical line test and the horizontal line test.

$$g(x) = 2^x$$

Exchange the x and y coordinates, (exchange the independent and dependent variables) and the result is a new function that is the inverse of the original.

$$y = 2^x$$

$$x = 2^y \rightarrow y = ?$$

$$(0, 1)$$

$$(1, 0)$$

$$(1, 2)$$

$$(2, 1)$$

$$(2, 4)$$

$$(4, 2)$$

$$(-1, 1/2)$$

$$(1/2, -1)$$

 Inverse Function Video

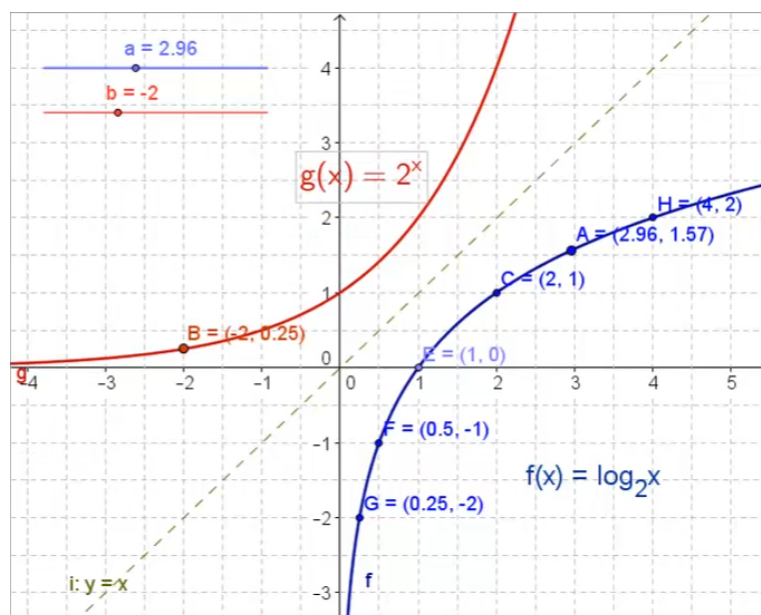
Class Notes: Prof. G. Battaly, Westchester Community College, NY

 College Algebra & Trig Home Page

 Homework

 inverseFunctionsBase2.mp4

4.2 Logarithmic Functions



[Inverse Function Video](#)

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

For $x > 0$ and $b > 0, b \neq 1$,
 $y = \log_b x$ is equivalent to $b^y = x$

The log is the exponent.

$$\log_b x = y$$

[Inverse Function Video](#)

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

The log is the exponent.

$$b^2 = 100$$

Start: $\log \quad = 2$

the log is the exponent

$$b^2 = 100$$

① $\log \square = 2$

② $\log_b \square = 2$

③ $\log_b 100 = 2$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

exponential

logarithmic

$$b^2 = 100$$

$$\log_b 100 = 2$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$5^4 = 625$$

① $\log_{\square} \square = \square$

② $\log_{\square} \square = \square$

③ $\log_{\square} \square = \square$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$5^4 = 625$$

① $\log_{\square} \square = 4$

② $\log_5 \square = 4$

③ $\log_5 625 = 4$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$8^Y = 300$$

$$\log_{\square} \square = \square$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$8^Y = 300$$

$$\log_{\underline{8}} \underline{300} = \underline{Y}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$2^5 = x$$

$$\log_{\square} \square = \square$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$2^5 = x$$

$$\log_{\square} \square = \square$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$6 = \log_2 64$$

exp is the log

$$\boxed{}^{\boxed{6}} = \boxed{}$$

$$\boxed{2}^{\boxed{6}} = \boxed{}$$

$$\boxed{2}^{\boxed{6}} = \boxed{64}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$3 = \log_b 27$$

$$\boxed{}^{\boxed{}} = \boxed{}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$3 = \log_b 27$$

$$\boxed{b}^{\boxed{3}} = \boxed{27}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

Evaluate: $\log_6 36$

Need to find the exponent on
base 6 that results in 36.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

Evaluate: $\log_6 36$

Need to find the exponent on
base 6 that results in 36.

$$\log_6 36 = x$$

$$6^x = 36$$

$$x = 2$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

Evaluate: $\log 49$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

Evaluate: $\log 49 = x$

$$7^x = 49$$

$$x = 2$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$F: \log_3 243$$

Need to find the exponent on base 3
that results in 243.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$F: \log_3 243$$

Need to find the exponent on base 3
that results in 243.

$$\log_3 243 = x$$

$$3^x = 243$$

$$x = 5$$

$$\begin{aligned} 243 &= 3 \cdot 81 \\ &= 3 \cdot 9 \cdot 9 = 3 \cdot 3^2 \cdot 3^2 \end{aligned}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$F: \log(100)$$

Convention: log with no base means base 10

Need to find the exponent on base 10
that results in 100.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$F: \log(100)$$

Convention: log with no base means base 10

Need to find the exponent on base 10
that results in 100.

$$\log_{10}(100) = x$$

$$10^x = 100$$

$$x = 2$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$F: \log_2 2 \quad \log_3 3$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

F:

$$\log_2 2$$

$$\log_2 2 = x$$

$$2^x = 2$$

$$x = 1$$

$$\log_3 3$$

$$\log_3 3 = x$$

$$3^x = 3$$

$$x = 1$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$\log_b b = ?$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

The log is the exponent.

$$\log_b b = ?$$

1

$$\log_{21} 21 = 1$$

$$\log_{\frac{1}{2}} \frac{1}{2} = 1$$

$$\log_b b = 1$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

[Inverse Function Video](#)

4.2 Logarithmic Functions

$$\log_6 \sqrt{6}$$

$$\log_3 \sqrt{3}$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

$$\log_6 \sqrt{6} = x$$

$$6^x = \sqrt{6} = 6^{\frac{1}{2}}$$

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

$$\log_3 \sqrt{3} = \frac{1}{2}$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

$$\ln e^6 = ?$$

$$e^{\square} = e^6$$

$$\ln e^6 = 6$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

$$\log 10^4 =$$

$$\log 10000 =$$

$$\log 100 =$$

$$\ln e^{10} =$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

 [College Algebra & Trig Home Page](#) [Homework](#)

4.2 Logarithmic Functions

$$\log 10^4 = 4$$

$$\log 10000 = 4$$

$$\log 100 = 2$$

$$\ln e^{10} = 10$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

 [College Algebra & Trig Home Page](#) [Homework](#)

4.2 Logarithmic Functions

$$\log 1000 =$$

$$\log 10^3 =$$

$$\log 10^8 =$$

$$\ln e =$$

$$\ln e^{13x} =$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

4.2 Logarithmic Functions

$$\log 1000 = 3$$

$$10^3 = 1000$$

$$\log_{10} 10^3 = 3$$

$$10^5 = 100000$$

$$\log 10^8 = 8$$

$$\ln e = 1$$

$$\ln e^{13x} = 13x$$

$$\log_b b^k = k$$

Class Notes: Prof. G. Battaly, Westchester Community College, NY

[College Algebra & Trig Home Page](#)

[Homework](#)

Attachments

slope_intercept.mp4

InverseFunctionBase2.mp4