



Central High School- Everyone Connects:  
Attend, Engage, Achieve



GOLD BROWN

**Alg 2 Agenda 4/3 & 4/4:**

- 1.) Showdown: Lesson 2-5 Review (25-30 min)
- 2.) HW Questions: Lesson 5 WS (10-15 min)
- 3.) NOTES: Properties of Logarithms (35-40 min)

- Turn-in your HW
- get out your notes
- get a blank piece of paper for warm-up

Concept Check w/Showdown:

Unit 7 Lesson Properties Practice

- 4.) HW: U7L6 Properties of Logarithms WS

**UNIT 7 TEST**



4-17/4-18

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*Work to Learn,  
and the grade will follow!*

**NOTE CHANGE OF PLANS**



**U7 L1-5 QUIZ  
NEXT CLASS!**



## Properties of Logarithms



I can simplify expressions using the properties of logarithms.  
I can solve logarithmic equations using the properties of logarithms.

*Since logarithms are exponents, the properties of logarithms can be derived from the properties of exponents.*

*→ add two logs → multiply arguments*

### Product Property of Logarithms

$$\log_b mn = \log_b m \oplus \log_b n$$

*everything needs to be positive*  
 $m > 0, n > 0, b > 0, b \neq 1$

*ie:*  $\log_2 2x \oplus \log_2 5 = \log_2 10x$

*ie:*  $\log_5 (4x)(7) = \log_5 4x + \log_5 7$



## Properties of Logarithms



I can simplify expressions using the properties of logarithms.  
I can solve logarithmic equations using the properties of logarithms.

→ Subtract two logs → divide arguments (1st part is numerator)

### Quotient Property of Logarithms

$$\log_b \frac{m}{n} = \log_b m \ominus \log_b n \quad m > 0, n > 0, b > 0, b \neq 1$$

ie:  $\log_2 2x \ominus \log_2 5 = \log_2 \left( \frac{2x}{5} \right)$  ie:  $\log_5 \left( \frac{4x}{7} \right) = \log_5 4x - \log_5 7$

→ # before log → exponent on argument

### Power Property of Logarithms

$$\log_b m^p = p \log_b m \quad p \in \mathbb{R}, m > 0, b > 0, b \neq 1$$

ie:  $2 \log_7 (3x) = \log_7 (9x^2)$

ie:  $\log_2 x^6 = 6 \log_2 x$



# Properties of Logarithms



I can simplify expressions using the properties of logarithms.

I can solve logarithmic equations using the properties of logarithms.

Examples: Rewrite each expression as one logarithm.

1.  $\frac{1}{3} \log_7 64^{1/3} + \log_7 13$

$\log_7 4 + \log_7 13 = \log_7 52$

① Power Property

② Product/Quotient  
left to right

2.  $2 \log_2 x + \log_2 (x + 3)$

$\log_2 x^2 + \log_2 (x + 3) = \log_2 (x^2 + 3x)$   
\* distribute

3.  $\log_8 5 - \log_8 (x + 3)$

$\log_8 \left( \frac{5}{x+3} \right)$

4.  $2 \log_2 3 + \log_2 (b + 1) - \log_2 5$

$\log_2 9 + \log_2 (b + 1) - \log_2 5$

$\log_2 (9b + 9) - \log_2 5 = \log_2 \left( \frac{9b + 9}{5} \right)$



# Properties of Logarithms



I can simplify expressions using the properties of logarithms.  
I can solve logarithmic equations using the properties of logarithms.

## Solving Logarithmic Equations

Ex 5)  $4\log_2 x - \log_2 5 = \log_2 125$

$\log_2 x^4 - \log_2 5$

$\log_2 \left(\frac{x^4}{5}\right) = \log_2 125$

$5 \cdot \frac{x^4}{5} = 125 \cdot 5$

$x^4 = 625$

$x^4 - 625 = 0$

$(x^2 + 25)(x^2 - 25) = 0$

$x^2 + 25 = 0$   $(x+5)(x-5)$   
 $x^2 = -25$   $x+5=0$   $x-5=0$   
 $x = \pm 5i$   $x = -5$   $x = 5$

## STEPS

1. Combine if two logs on one side. of =
2. If one log on each side, cancel logs.
3. If only one log, rewrite as exponential

~~$x = -5$~~ ,  $x = 5$  (boxed)

Check

$\log_2 x$   $\log_2 x$  ✓ positive  
 $\log_2 -5$  ← not positive  $\log_2 5$

**Don't forget to check your solutions!!**



# Properties of Logarithms



I can simplify expressions using the properties of logarithms.  
I can solve logarithmic equations using the properties of logarithms.

**Ex 6)**  $\log_8 x + \log_8 (x - 12) = 2$

$\log_8 (x^2 - 12x) = 2$

$$8^2 = x^2 - 12x$$

$$0 = x^2 - 12x - 64$$

$$0 = (x - 16)(x + 4)$$

$x = 16$   $x = -4$

Check

$\log_8 x$   $\log_8 (x - 12)$   
 $\log_8 16$   $\log_8 (16 - 12)$   
 $\log_8 4$

positive

$\log_8 x = \log_8 -4$   
not positive

**Don't forget to check your solutions!!**



# Properties of Logarithms



Obj: Know the properties of exponents.

Obj: Simplify and evaluate expressions using the properties of logarithms.

Obj: Solve logarithmic equations using the properties of logarithms.

**Ex 7)**  $\frac{1}{3} \log_2 27^{1/3} + \log_2 36 = \log_2 n$

$\log_2 3 + \log_2 36 =$

$\log_2 108 = \log_2 n$

1 log each side  
 ↓  
 cancel log

$108 = n$

Check

$\log_2 n$   
 $\log_2 108$

positive

**Don't forget to check your solutions!!**



# Properties of Logarithms



I can simplify expressions using the properties of logarithms.  
I can solve logarithmic equations using the properties of logarithms.

**Ex 8)**  $\log_2(14) - \log_2(b+1) = 1$

$$\log_2\left(\frac{14}{b+1}\right) = 1$$

one log  
↓  
rewrite as exponential

$$(b+1) 2^1 = \frac{14}{b+1} (b+1)$$

$$2b+2 = 14$$

$$2b = 12$$

$$b = 6$$

Check positive

$$\log_2(b+1) = \log_2(7)$$

**Don't forget to check your solutions!!**



## **Properties of Logarithms**

Obj: Know the properties of exponents.

Obj: Simplify and evaluate expressions using the properties of logarithms.

Obj: Solve logarithmic equations using the properties of logarithms.

### **Homework:**

## **U7L6 Properties of Exponents WS**



**U7 L1-5 QUIZ  
NEXT CLASS!**

## **UNIT 7 TEST**



**4-17/4-18**

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**Graphing Rational Functions  
Quiz RETAKE**



**Must be completed by THURSDAY!**