Your Name

Mrs. Theo

3/18/21

6.5

Notes

LOG PROPERTIES

Log Bases

When you see a log with no base indicated, you assume base 10.

$\log 6 = \log_{10} 6$ (base 10 allows you to use the log function on your calculator)

When you see a ln x

This is called the natural log of x

$\ln x = \log_e x$ (use ln button, base e allows you to get to the exponent if e is the base)

Changing Bases

To graph, you will need to change bases

$$\log_m x = \frac{\log x}{\log m}$$

log of base

Helpful things to remember:

we want to use base 10,

so it is just log of what you want, divided by log of the base you need

Changing Bases EXAMPLES

$\log_7(105) = 2.392$

$\frac{\log(105)}{\log(7)}$

2.392

$7^{2.392} = 105$

$7^2 = 49$

$7^3 = 343$

$\log_7(x+5)$

$\frac{\log(x+5)}{\log(7)}$

$\log_4(2x-3)$

$\frac{\log(2x-3)}{\log 4}$

$\log_{5x}(2x^2+7)$

$\frac{\log(2x^2+7)}{\log 5x}$

Go to your homework and apply the change of base rule to 21-30

Apply change of base, then check in calculator

Properties of Logarithms

- Power Rule: $\log_m x^y = y \log_m x$
- Inverse 1: $\log_b b^y = y$
- Inverse 2: $b^{\log_b y} = y$

logs and bases cancel

Helpful things to remember:

logs were created to undo bases with exponents

Simplifying logarithms EXAMPLES

Power Rule: $\log_m x^y = y \log_m x$
Inverse 1: $\log_b b^y = y$
Inverse 2: $b^{\log_b y} = y$

$\log x^2$

$2 \log x$

$\text{Log}_3(wzy)^3$

$3\log_3 wzy$

~~$\text{Log}_3 3^4$~~

4

~~$\log_2 2^x$~~ $= 12$

$x = 12$

$2\log_x 5^4 = 8$

$\log_x (5^4)^2 = 8$

$\log_x 5^8 = 8$

$x = 5$ $x^8 = 5^8$ $x = 5$

$\text{Log}_7 x^4 = 4$

$7 = x$

~~$8^{\log_8 y}$~~ $= 4$

$y = 4$

~~$x^{\log_x y}$~~ $= 4$

$Y = 4$

Simplifying logarithms Homework

Power Rule: $\log_m x^y = y \log_m x$
Inverse 1: $\log_b b^y = y$
Inverse 2: $b^{\log_b y} = y$

Simplify/rewrite using the Rules

1.) $\log x^{23}$

2.) $\text{Log}_8(w+zy)^8$

3.) $\text{Log}_8 8^{(w+zy)}$

4.) $\text{Log}_4 5^4$

Solve the following equations

5.) $\log_3 3^x = 40$

6.) $3\log_x 4 = 3$

7.) $\text{Log}_9 x^{11} = 11$

8.) $8^{\log_8 y} = 4$

9.) $x^{2\log_x y} = 36$

10.) $9^{x\log_9 5} = 120$

Simplifying logarithms Homework

Power Rule: $\log_m x^r = y \log_m x$
Inverse 1: $\log_b b^y = y$
Inverse 2: $b^{\log_b y} = y$

Simplify/rewrite using the Rules

1.) $\log x^{23}$

$23 \log x$

2.) $\text{Log}_8(w+zy)^8$

$8 \log_8 (w+zy)$

3.) $\text{Log}_8 8^{(w+zy)}$

$w+zy$

4.) $\text{Log}_4 5^4$

$4 \log_4 5$

Solve the following equations

5.) $\log_3 3^x = 40$

$x = 40$

6.) $3\log_x 4 = 3$

$\log_x 4^3 = 3$

$x = 4$

7.) $\text{Log}_9 x^{11} = 11$

$9 = x$

8.) $8^{\log_8 y} = 4$

$y = 4$

9.) $x^{2\log_x y} = 36$

$x^{\log_x y^2} = 36$

$y^2 = 36$

$y = \pm 6$

10.) $9^{x\log_9 5} = 125$

$9^{\log_9 5^x} = 125$

$5^x = 125$

$\log_5 5^x = \log_5 125$

$x = \log_5 125$

$x = \frac{\log 125}{\log 5}$

$x = 3$

10.) $9^{x\log_9 5} = 120$

$9^{\log_9 5^x} = 120$

$5^x = 120$

$\log_5 5^x = \log_5 120$

$x = \log_5 120$

$x = \frac{\log 120}{\log 5}$

$x = 2.975$