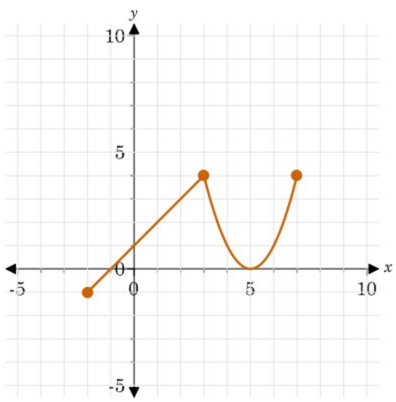
UNIT 5 Lessons 2, 4-6

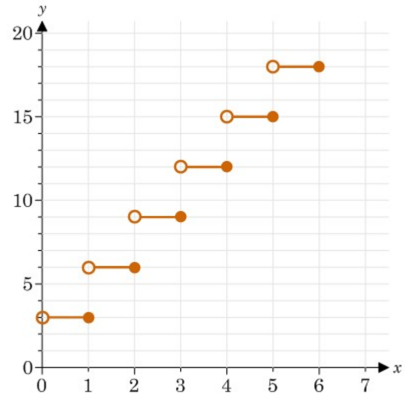
PRECALCULUS A

LESSONS:

- Logarithmic Notation
- Logarithm Rules & Solving Logarithmic Equations
- Solving Exponential Equations
- Piecewise Functions

First, a Piecewise Function is just when different intervals follow different function rules.





REVIEW:

The inverse of the EXPONENTIAL FUNCTION

$$f(x) = b^x$$

is the LOGARITHMIC FUNCTION

$$f(x) = \log_b x$$

REMINDER:

When changing from Exponential form to Logarithmic form, the log always equals the exponent, and has the same base as the exponential function.

Exponential Form: $2^x = 16$

Logarithmic Form: $\log_2 16 = x$

PRACTICE

1. Write the equation in logarithmic form.

$625 = 5^4$ *(1 point)*

$\log_4 625 = 5$

$\log_5 625 = 4$

$\log_5 4 = 625$

$\log_4 5 = 625$

2. Write the equation in logarithmic form.

$\left(\frac{1}{3}\right)^3 = \frac{1}{27}$ *(1 point)*

$\log_{\frac{1}{3}} \frac{1}{27} = 3$

$\log_{\frac{1}{3}} 3 = \frac{1}{27}$

$\log_3 27 = 3$

$\log_3 \frac{1}{27} = 3$

PRACTICE

1. Write the equation in logarithmic form.

$625 = 5^4$ *(1 point)*

$\log_4 625 = 5$

$\log_5 625 = 4$

$\log_5 4 = 625$

$\log_4 5 = 625$

2. Write the equation in logarithmic form.

$\left(\frac{1}{3}\right)^3 = \frac{1}{27}$ *(1 point)*

$\log_{\frac{1}{3}} \frac{1}{27} = 3$

$\log_{\frac{1}{3}} 3 = \frac{1}{27}$

$\log_3 27 = 3$

$\log_3 \frac{1}{27} = 3$

PRACTICE

3. Write the equation in exponential form.

$\log_2 128 = 7$ *(1 point)*

$7 = 2^7$

$49 = 7^2$

$128 = 7^7$

$128 = 2^7$

4. Write the equation in exponential form.

$\log_3 \frac{1}{9} = -2$ *(1 point)*

$3 = 9^{-2}$

$\frac{1}{9} = 3^{-2}$

$9 = 3^2$

$3 = 3^1$

PRACTICE

3. Write the equation in exponential form.

$\log_2 128 = 7$ *(1 point)*

$7 = 2^7$

$49 = 7^2$

$128 = 7^7$

$128 = 2^7$

4. Write the equation in exponential form.

$\log_3 \frac{1}{9} = -2$ *(1 point)*

$3 = 9^{-2}$

$\frac{1}{9} = 3^{-2}$

$9 = 3^2$

$3 = 3^1$

PRACTICE

Evaluate the logarithm.

$\log_2 16$ $\log_{49} 7$ $\log_5 1$ $\log_5(-25)$

PRACTICE

Evaluate the logarithm.

$\log_2 16$	$\log_{49} 7$	$\log_5 1$	$\log_5(-25)$
4	$\frac{1}{2}$	0	undefined

COMMON LOG is log base 10 … but we don't write the 10

NATURAL LOG is log base e … but we write it as ln (or LN)

* Look for these on your calculator!

$$\log a = -5$$

$$\ln \sqrt[3]{\frac{1}{e^2}}$$

$$\log a = -5$$

$$\ln \sqrt[3]{\frac{1}{e^2}}$$

$$\frac{1}{100,000}$$

$$-\frac{2}{3}$$

Sometimes it gets a little more complex, so it's good to know a few rules:

Logarithm Rules

product rule: $\log_b(AB) = \log_b A + \log_b B$

quotient rule: $\log_b\left(\frac{A}{B}\right) = \log_b A - \log_b B$

power rule: $\log_b A^r = r\log_b A$

corollary to the power rule: $\log_b\left(\frac{1}{A}\right) = -\log_b(A)$

These should remind you of the rules for exponents:

$$a^0 = 1$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$a^{-n} = \frac{1}{a^n}$$

$$(ab)^n = a^n b^n$$

$$a^m \cdot a^n = a^{m+n}$$

$$(a^m)^n = a^{mn}$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

LET'S TRY THIS:

Use the rules to put this back together as one logarithm.

Then change it to exponential form, and solve for x.

$$\log_4(x+4)+\log_4(x-2)=2$$

LET'S TRY THIS:

$$\log_4(x+4)+\log_4(x-2)=2$$

x = 4, -6

LET'S TRY THIS:

$$2 \log 4 - \log 3 + 2 \log x - 4 = 0$$

LET'S TRY THIS:

$$2 \log 4 - \log 3 + 2 \log x - 4 = 0$$

$x \sim 43.3013$

NOW TRY THESE:

$9^{8x} = 27$

$10^{6x} = 93$

Change it to the same base number … or … log both sides.

NOW TRY THESE:

$9^{8x} = 27$

$10^{6x} = 93$

$\frac{3}{16}$

0.3281

Find a common base, or, log both sides?

$$64^x = 256 \cdot 16^x$$

Find a common base, or, log both sides?

$$64^x = 256 \cdot 16^x$$

4

Find a common base, or, log both sides?

$$125^{8x-2} = 150$$

Find a common base, or, log both sides?

$$125^{8x-2} = 150$$

0.3797

Questions??

Review the Key Terms and Key Concepts documents for this unit.

Look up the topic at khanacademy.org and virtualnerd.com

Check our class website at nca-patterson.weebly.com

*Reserve a time for a call with me at
jpattersonmath.youcanbook.me
We can use the LiveLesson whiteboard
to go over problems together.