

6.3 Logarithmic Functions

- Obj: 1. Write equivalent forms for exponential & logarithmic eqns.
2. Use definitions to solve eqs.

$$3 = 2x - 1$$

+1 +1

$$\frac{4}{2} = \frac{2x}{2}$$

$$x = 2$$

Inverse Operations

Add/Sub

Mult/Div

 $\sqrt{\quad} / \square$

* EXP/Log

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$$\underline{10}^3 = 1000$$

exp. form

$$\log_{\underline{10}} 1000 = 3$$

log form

"log base 10 of 1000 = 3"

For any positive base b (where $b \neq 1$)

$$b^x = y \text{ iff}$$

exp form

$$\log_b y = x$$

log. form

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Simplify:

$$\log_2 32 = ?$$

2 to what exponent is 32?

$$2^? = 32$$

5

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$$\log_3 81$$

$$3^? = 81$$

4

$$\log_7 1$$

$$7^? = 1$$

0

$$\log_5 25$$

$$5^? = 25$$

2

$$\log_4 64$$

$$4^? = 64$$

3

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Write $5^3 = 125$ in log. form.

$$\log_5 125 = 3$$

Write $\log_3 81 = 4$ in exp. form.

$$3^4 = 81$$

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Solve: $10^x = 85$

$$\log_{10} 85 = x$$

\log_{10} — : "Common logarithm"

$$x = 1.93$$

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Solve: $10^x = \frac{1}{109}$

$$\log_{10} \frac{1}{109} = x$$

$$x = -2.04$$

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One-to-One Property

- If $b^x = b^y$ then $x = y$

- If $a^x = b^x$ then $a = b$

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Solve:

$$v = \log_4 64$$

$$4^v = 64$$

$$4^v = 4^3$$

$$v = 3$$

$$2 = \log_v 25$$

$$v^2 = 25$$

$$v^2 = 5^2$$

$$v = 5$$

$$6 = \log_3 v$$

$$3^6 = v$$

$$v = 729$$

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Solve:

$$4 = \log_3 v$$

$$3^4 = v$$

$$v = 81$$

$$5 = \log_v 32$$

$$v^5 = 32$$

$$v^5 = 2^5$$

$$v = 2$$

$$v = \log_{125} 5$$

$$125^v = 5^1$$

$$(5^3)^v = 5$$

$$5^{3v} = 5^1$$

$$3v = 1$$

$$v = \frac{1}{3}$$

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$$\text{pH} = -\log[\text{H}^+] \quad [\text{H}^+]: \text{hydrogen ion concentration}$$

pH of Soda is 3. Find its $[\text{H}^+]$.

$$\text{pH} = -\log[\text{H}^+]$$

$$3 = -\log[\text{H}^+]$$

$$\frac{3}{-1} = \frac{-\log[\text{H}^+]}{1}$$

$$-3 = \log[\text{H}^+]$$

$$10^{-3} = [\text{H}^+]$$

$$.001 = [\text{H}^+]$$

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