$\log_b y = x \rightarrow b^x = y$

10) $\ln 1$

$\log_e 1$

$e^x = 1$

0

12) $\log_6 (6^5)$

$6^x = 6^5$

5

13) $\log_{1/4} \left(\frac{1}{4}\right)$

$\left(\frac{1}{4}\right)^x = \frac{1}{4}$

1

14) $\log_9 3$

$9^x = 3$

$\frac{1}{2}$

- large # → small #
  - fraction exponent

- whole # ⟷ fraction
  - negative exponent

Apr 24-10:09 AM

Exponential Functions 6 - Properties of Logarithms

Standards: **F-LE.4**, **F-BF.5**

Learning Targets:
-How do you do logs in a calculator?
-What is the power property for logs?

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Power Property:

(let *b* and *u* be positive numbers such that b ≠ 1)

$$\log_b u^n = n \log_b u$$

Example 1 - Evaluate:

a) $\log_4 16^5$

$4^x = 16^5$ weird

$5 \cdot \log_4 16$

$4^x = 16$

$5 \cdot 2$

10

b) $\log_9 \left(\frac{1}{3}\right)^4$

$4 \cdot \log_9 \left(\frac{1}{3}\right)$

$9^x = \frac{1}{3}$

$4 \cdot -\frac{1}{2}$

-2

c) $\ln e^{1/5}$

$\log_e e^{1/5}$

$\frac{1}{5} \cdot \log_e e$

$e^x = e$

$\frac{1}{5} \cdot 1$

$\frac{1}{5}$

Logs with any base other than 10 or e can be written in terms of common or natural logs using the

Change-of-Base Formula

Let u, b, c be positive with $b \neq 1$ and $c \neq 1$. Then

$$\log_c u = \frac{\log_b u}{\log_b c}$$

In particular,

Base10:

$$\log_c u = \frac{\log u}{\log c}$$

and **Natural Base:**

$$\log_c u = \frac{\ln u}{\ln c}$$

Example2:
evaluate $\log_3 7$ using common & natural logs.

$$\frac{\log(7)}{\log(3)} \approx 1.77\ldots$$

$$\frac{\ln(7)}{\ln(3)} \approx 1.77\ldots$$