

October 15

Evaluate Logarithms

(Ex1) Evaluate:

$$\log_9 81 = \boxed{2}$$

$$\log_2 8 = \boxed{3}$$

$$\log_3 10 = \boxed{2.10}$$

$$\log_5 4 = \boxed{.86}$$

$$\log_{10} 53 = \boxed{1.72}$$

ALPHA WINDOW

5: logBASE

Natural Logarithm

"ln" means natural log

Natural log can only have a base of e.

(Ex2) Evaluate $\ln 13 = \boxed{2.56}$

(Ex3) Solve: $e^{(2x+4)} = 3$

$$2x + 4 = e^3$$

$$2x + 4 = 20.09$$

$$\begin{array}{r} 2x + 4 = 20.09 \\ -4 \quad -4 \\ \hline \end{array}$$

$$2x = 16.09$$

$$\begin{array}{r} 2x = 16.09 \\ \div 2 \quad \div 2 \\ \hline \end{array}$$

$$\boxed{x = 8.04}$$

Solve Log Equations Using Properties

● (Ex4) Solve: $\log_3 5 + \log_3 (x+2) = 4$

multiply (circled 5) \rightarrow \log_3 \rightarrow (circled $x+2$)
 \uparrow
adding

Property: $\log_b M + \log_b N = \log_b M \cdot N$

Translation: If two logs with the same base are being added, you can write it as one log by multiplying what is inside the logs.

$$\log_3 5 \cdot (x+2) = 4$$

$$\log_3 (5x+10) = 4$$

$$5x+10 = 3^4$$

$$5x+10 = 81$$

$$\begin{array}{r} -10 \\ -10 \end{array}$$

$$\frac{5x}{5} = \frac{71}{5}$$

$$\boxed{x = 14.2}$$

Ex 5) Solve: $\log_8 4x^4 - \log_8 2x^2 = 1$

\swarrow divide \searrow
 \uparrow subtracting

Property: $\log_b M - \log_b N = \log_b \frac{M}{N}$

Translation: If two logs with the same base are being subtracted, you can write it as one log by dividing what is inside the logs.

$$\log_8 \frac{4x^4}{2x^2} = 1$$

~~$$\log_8 (2x^2) = 1$$~~

$$2x^2 = 8^1$$

~~$$2x^2 = 8$$~~

$$\sqrt{x^2} = \sqrt{4}$$

$$\boxed{x = 2}$$

Ex 6) Solve: $\ln(x+2) - \ln 3 = 2$

\swarrow divide \searrow
 \uparrow subtracting

~~$$\ln \left(\frac{x+2}{3} \right) = 2$$~~

$$\frac{x+2}{3} = e^2$$

~~$$3 \cdot \frac{x+2}{3} = 7.39 \cdot 3$$~~

$$x+2 = 22.17$$

$$\begin{array}{r} x+2 = 22.17 \\ -2 \quad -2 \\ \hline \boxed{x = 20.17} \end{array}$$