

Logs they are not just for Rolling

$$x = 2^y \leftrightarrow \log_2 x = y$$

↑  
base #

—————→

Logarithmic Functions

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

$$2^x = 4$$

$$\sqrt{x} 2^x = 32$$

$$\sqrt{x^2} = \sqrt{25}$$

$$x = \pm 5$$

$$\log_2 32 = y$$

$$2^y = 32$$

$$y = 5$$

$$\log_2 32 = 5$$

$$2^5 = 32$$

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$$\log_2 1 = y \leftrightarrow$$

$$2^y = 1$$

$$y = 0$$

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$$\text{Rule} \rightarrow \log_b 1 = 0$$

$$b^0 = 1$$

$$\text{Log}_{10} 10 = y$$

$$10^y = 10$$
$$y = 1$$

$$\text{Rule} \rightarrow \text{Log}_b b = 1$$

$$\text{Log}_? \rightarrow \text{Log}_{10}$$

$$\text{Find } \text{Log } 100 = 2 \Leftrightarrow 10^2 = 100$$

$$\text{Log } .01 = -2 \Leftrightarrow 10^{-2} = \frac{1}{100}$$

$$\text{Log } \frac{15}{8} = .273$$

$$\frac{\text{Log } 15}{\text{Log } 8} = 1.302$$

$$\text{Log } (15) / \text{Log } (8)$$

$$\log_2 32 = x$$

Rule Change of Base

$$\log_b x = \frac{\log x}{\log b} \quad \text{Rule}$$

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$$\log_2 32 = \frac{\log 32}{\log 2} = 5$$

$$\log_5 18 = \frac{\log 18}{\log 5} = 1.796$$

$$\text{Log}(20) \cdot \text{Log}(5) = .909$$

$$5 \cdot \text{Log}(20) = 6.505 \leftarrow$$

$$\text{Log}(20) + \text{Log}(5) = 2$$

$$1) \text{Log}(20 \cdot 5) = 2$$

$$\text{Rule } \text{Log}(xy) = \text{Log } x + \text{Log } y$$

$$2) \text{Log}(20^5) = 6.505$$

$$\text{Rule } \text{Log } x^y = y \text{Log } x$$

$$\text{Log } 100 = \text{Log } 10^2$$

$$= 2 \text{Log}_{10} 10$$

$$= 2(1) = 2$$

$$2^x = 32 \quad \leftrightarrow \quad \text{Log}_2 32 = x$$

$$\text{Log } 2^x = \text{Log } 32$$

$$x \text{Log } 2 = \text{Log } 32$$

$$x = \frac{\text{Log } 32}{\text{Log } 2} = 5$$

$$\text{Log}(20) \cdot \text{Log}(5) = .909$$

$$\text{Log}(20) / \text{Log}(5) = 1.861$$

$$\text{Log}(20) - \text{Log}(5) = .602$$

$$\text{Log}\left(\frac{20}{5}\right) = .602$$

$$\text{Rule } \text{Log} \frac{x}{y} = \text{Log } x - \text{Log } y$$

rewrite

$$\text{Log}_3(81 \cdot 27)$$

$$\text{Log}_3(81) + \text{Log}_3(27)$$

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

$$4 \text{Log}_3 3 + 3 \text{Log}_3 3$$

$$4 + 3$$

$$7$$

$$\begin{aligned}\log_5 (5x^2y) &= \\ \log_5 5 + \log_5 x^2 + \log_5 y & \\ 1 + 2\log_5 x + \log_5 y &\end{aligned}$$

$$\log_5 \left( \frac{25}{18} \right)$$

$$\log_5 25 - \log_5 18$$

$$\log_5 5^2 - \log_5 18$$

$$2 \log_5 5 - \log_5 18$$

$$2 - \log_5 18$$

$$\begin{aligned}\log_a(a^3 b^2 c^5) \\ \log_a a^3 + \log_a b^2 + \log_a c^5 \\ 3\log_a a + 2\log_a b + 5\log_a c \\ 3 + 2\log_a b + 5\log_a c\end{aligned}$$

$$\log_3 \sqrt{\frac{x^4}{y^3 z^2}} = \log_3 \left( \frac{x^4}{y^3 z^2} \right)^{1/2}$$

$$\frac{1}{2} \log_3 \frac{x^4}{y^3 z^2}$$

$$\frac{1}{2} (\log_3 x^4 - \log_3 y^3 z^2)$$

$$- (\log_3 y^3 + \log_3 z^2)$$

$$\frac{1}{2} (\log_3 x^4 - \log_3 y^3 - \log_3 z^2)$$

$$\frac{1}{2} (4 \log_3 x - 3 \log_3 y - 2 \log_3 z)$$

$$\text{Done} \rightarrow 2 \log_3 x - \frac{3}{2} \log_3 y - \log_3 z$$

## Homework

12-3 pg 884 # 9-35 odd  
# 65-109 odd

12-4 pg 891- # 7-11, 13-53 odd  
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