

Pre-Calculus Notes – Day 7-1
5.5: Properties of Logarithms

Use the following properties: $\log_a a^r = r$ $a^{\log_a M} = M$

a) $\log_\pi \pi =$

b) $5^{\log_5 \sqrt{3}} =$

c) $\ln e^{0.35t} =$

Properties of Logarithms

Let a be a positive number, with $a \neq 1$.

Let M , N , and r be any real numbers with $M > 0$ and $N > 0$.

1. $\log_a (MN) = \log_a M + \log_a N$

2. $\log_a \left(\frac{M}{N} \right) = \log_a M - \log_a N$

3. $\log_a (M^r) = r \log_a M$

Evaluate each expression.

EX 1: $\log_4 192 - \log_4 3$

EX 2: $\log_2 6 - \log_2 15 + \log_2 20$

EX 3: $\log_4 16^{100}$

Use the above rules to expand the following.

(This means to write the logarithms of a product or quotient as the sum or difference of logarithms.)

EX 4: $\log_5 \sqrt[3]{x^2 + 1}$

EX 5: $\ln \left(x \sqrt{\frac{y}{z}} \right)$

EX 6: $\log_3 \frac{\sqrt[4]{x^3}}{y^2}$

EX 7: $\ln \frac{\sqrt{xy^3}}{w^2 z^5}$

$$\text{EX 8: } \log_b \frac{(x-y)^3}{z^4}$$

Use the above rules to condense or combine the following.

(This means to write the sums and differences of logarithms as a single logarithm.)

$$\text{EX 9: } \frac{1}{2} \log y - 2 \log x - \frac{2}{3} \log z$$

$$\text{EX 10: } \frac{3}{4} \ln(16y) - 2 \ln x + \frac{1}{4} \ln y$$

$$\text{EX 11: } \frac{2}{3} \log_3 x^3 - \log_3 \left(\frac{3}{4} y \right) - \log_3 10$$

Change of Base Formula: $\log_a M = \frac{\log_b M}{\log_b a}$

Evaluate each logarithm, correct to six decimal places.

EX 12: $\log_3 59$

EX 13: $\log_{16} 3.56$

EX 14: $\log_{\sqrt{2}} \sqrt{5}$

Pre-Calculus Notes – Day 7-1
5.6: Exponential and Logarithmic Equations

Properties of Logarithms

In the following properties, M , N , and a are positive real numbers, $a \neq 1$.

If $M = N$, then $\log_a M = \log_a N$.	(7)
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If $\log_a M = \log_a N$, then $M = N$.	(8)
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Find the solution of the exponential equation, correct to the nearest four decimal places.

EX 1: $3^x = 7$

EX 2: $5 \cdot 2^x = 3$

EX 3: $2^{x-1} = 5^{2x+3}$

EX 4: $4^{2x-1} = 27$

SKIP

EX 5: $2(15^{3x-1}) - 142 = 0$

EX 6: $4(6^{2x-1}) - 3^{4x+5} = 0$

EX 7: $3e^{2x-1} = 12$

SKIP

Solve the equation.

EX 8: $\log_3 4 = 2\log_3 x$

EX 9: $9^x - 3^x - 6 = 0$

EX 10: $x^2 e^x - 3x e^x - 3e^x = 0$

SKIP

EX 11: $\log_3(x^2 + 6x - 7) = 2$

EX 12: $\log_4 x + \log_4(x-1) = \frac{1}{2}$

EX 13: $\ln x + \ln(x-2) = 1$