

Precalculus

Homework

Logarithms basics

1. Use the definition of a logarithm to evaluate each of the following without using a calculator. The answer key has not been proofread, use with caution.

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| (a) $\log_2 16$. | (d) $\log_6 36^{-\frac{2}{3}}$. |
| (b) $\log_3 \left(\frac{1}{9}\right)$. | (e) $\log_2(8\sqrt{2})$. |
| (c) $\log_{10} 1000$. | (f) $\log_{\frac{1}{2}}(4)$. |
| | (g) $\log_{\frac{1}{9}}(\sqrt{3})$. |

2. Find the exact value of each expression.

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| (a) $\log_5 125$. | (h) $\log_5 4 - \log_5 500$. |
| (b) $\log_3 \frac{1}{27}$. | (i) $\log_2 6 - \log_2 15 + \log_2 20$. |
| (c) $\ln \left(\frac{1}{e}\right)$. | (j) $\log_3 100 - \log_3 18 - \log_3 50$. |
| (d) $\log_{10} \sqrt{10}$. | (k) $e^{-2 \ln 5}$. |
| (e) $e^{\ln 4.5}$. | (l) $\ln \left(\ln e^{e^{10}}\right)$. |
| (f) $\log_{10} 0.0001$. | (m) $\log_7 \left(\frac{49^x}{343^y}\right)$. |
| (g) $\log_{1.5} 2.25$. | |

3. Using only the \ln operation of your calculator compute the indicated logarithm. Confirm your computation numerically by exponentiation.

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| (a) $\log_5(13)$. | (c) $\log_{13}(101)$. |
| (b) $\log_{12}(9)$. | (d) $\log_{10}(2015)$. |

4. Express each of the following as a single logarithm. If possible, compute the logarithm without using a calculator. The answer key has not been proofread, use with caution.

- (a) $\ln 4 + \ln 6 - \ln 5$.
- (b) $2 \ln 2 - 3 \ln 3 + 4 \ln 4$.
- (c) $\ln 36 - 2 \ln 3 - 3 \ln 2$.
- (d) $\log_2(24) - \log_4 9$.
- (e) $\log_7(24) + \log_{\frac{1}{7}} 3 - \log_{49}(64)$.
- (f) $\log_3(24) + \log_3 \left(\frac{3}{8}\right)$.

5. Demonstrate the identity(s).

- (a) $-\ln(\sqrt{1+x^2} - x) = \ln(x + \sqrt{1+x^2})$