

# Natural Logarithms



## Overview of Problems

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### Example Set: A

**Evaluate the expression without a calculator:**

1.  $\ln e$
2.  $3 \ln 1$
3.  $\ln e^{-4}$
4.  $\ln\left(\frac{1}{e^2}\right)$



### Example Set: B

**Use your calculator to evaluate the expression:**

1.  $\ln 3.8$
2.  $\frac{1}{2} \ln 4 + \ln 7$
3.  $5.6 \ln e - 8 \ln 2.2$
4.  $4 \ln 2.9$
5.  $\ln 12 - \ln 3$
6.  $\ln(2.4^{-3})$

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### Example Set: C

**Expand the expression:**

1.  $\ln 4x$

2.  $\ln \frac{2x^5}{y^2}$

3.  $\ln(ab)^2$

4.  $\ln x^2y^4$

5.  $\ln 6w^5z^8y$

6.  $\ln \frac{x^{-3}y^6}{xy^{-9}}$

### Example Set: D

**Condense the expression:**

1.  $\ln 15 - \ln 3$

2.  $4 \ln 3 - (\ln 18 - 2 \ln 3)$

3.  $\ln 30 + \frac{1}{3} \ln 27$

4.  $\left( \ln x^2 - \ln \frac{1}{x} \right)^2$

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### Example Set: A - **ANSWER KEY**

**Evaluate the expression without a calculator:**

1.  $\ln e$  **1**

2.  $3 \ln 1$  **0**

3.  $\ln e^{-4}$  **-4**

4.  $\ln\left(\frac{1}{e^2}\right)$  **-2**



### Example Set: B- **ANSWER KEY**

**Use your calculator to evaluate the expression:**

1.  $\ln 3.8$  **1.335**

2.  $\frac{1}{2} \ln 4 + \ln 7$  **2.639**

3.  $5.6 \ln e - 8 \ln 2.2$  **-.707**

4.  $4 \ln 2.9$  **4.258**

5.  $\ln 12 - \ln 3$  **1.386**

6.  $\ln(2.4^{-3})$  **-2.626**

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### Example Set: C-ANSWER KEY

**Expand the expression:**

1.  $\ln 4x$   $\ln 4 + \ln x$

2.  $\ln \frac{2x^5}{y^2}$   $[\ln 2 + 5 \ln x] - 2 \ln y$

3.  $\ln(ab)^2$   $2 \ln a + 2 \ln b$

4.  $\ln x^2 y^4$   $2 \ln x + 4 \ln y$

5.  $\ln 6w^5 z^8 y$   $\ln 6 + 5 \ln w + 8 \ln z + \ln y$

6.  $\ln \frac{x^{-3} y^6}{x y^{-9}}$   $-4 \ln x + 15 \ln y$



### Example Set: D-ANSWER KEY

**Condense the expression:**

1.  $\ln 15 - \ln 3$   $\ln 5$

2.  $4 \ln 3 - (\ln 18 - 2 \ln 3)$   $\ln 90$

3.  $\ln 30 + \frac{1}{3} \ln 27$   $\ln \frac{3^4}{2}$

4.  $(\ln x^2 - \ln \frac{1}{x})^2$   $(\ln x^3)^2$