

Properties of Logarithms

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4.4 Properties of Logarithms PreCalc
Unit 4 Day 5

Product Property: $\log_b mn = \log_b m + \log_b n$

Quotient Property: $\log_b \frac{m}{n} = \log_b m - \log_b n$

Power Property: $\log_b m^p = p \cdot \log_b m$

Root Property: $\log_b \sqrt[p]{m} = \frac{1}{p} \cdot \log_b m$

Remember: $\log_a m = \ln m$
 $\log_a m = \log m$

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Express in terms of sums and differences of logs:

Variables / Coefficients / Constants $\rightarrow$ **logs/lns**
how many you have

- $\ln x^3 \sqrt{y}$
 $\therefore \ln x^3 + \ln \sqrt{y}$
 $\therefore \ln x^3 + \ln y^{1/2}$
 $\therefore 3 \ln x + \frac{1}{2} \ln y$
- $\log \sqrt{\frac{x^2 y}{z}}$
 $= \log \left(\frac{x^2 y}{z} \right)^{1/2}$
 $= \frac{1}{2} \log \frac{x^2 y}{z} = \frac{1}{2} (2 \log x + \log y - \log z)$
 $= \log x + \frac{1}{2} \log y - \frac{1}{2} \log z$
- $\log \left(\frac{a^2}{3b^4} \right)^3$
 $\therefore \log \frac{a^6}{27b^{12}}$
 $\therefore 6 \log a - (\log 27 + 12 \log b)$
 $\therefore 6 \log a - \log 27 - 12 \log b$
- $\ln \left(\frac{xy}{z^3} \right)$
 $\therefore \ln x + \ln y - 3 \ln z$

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Write as a single log: **Squish**

- $\log(2x+7) + \log(x-1)$
 $\therefore \log(2x+7)(x-1)$
 $\therefore \log 2x^2 + 5x - 7$
- $2 \ln(x-3) - \ln(x^2-9)$
 $\therefore \ln \frac{(x-3)^2}{x^2-9} = \ln \frac{(x-3)(x-3)}{(x-3)(x+3)}$
 $= \ln \frac{(x-3)}{(x+3)}$
- $\log a + \frac{1}{2}(\log b - \log c)$
 $\therefore \log a + \frac{1}{2} \log \frac{b}{c}$
 $\therefore \log a + \frac{\sqrt{b}}{\sqrt{c}}$
 $\therefore \log a \sqrt{\frac{b}{c}}$
- $2 - \log(10x)$
 $\log 100 - \log(10x)$
 $\therefore \log \frac{100}{10x}$
 $\therefore \log \frac{10}{x}$

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- $2 \ln(x-5) + \ln x$
- $\ln e^{5x}$

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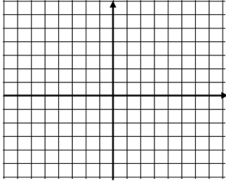
7. Graph $y = \ln x$. Find domain, range and intercepts.

D:

R:

x-intercept(s):

y-intercept(s):



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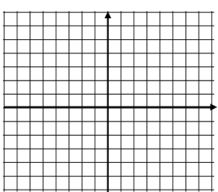
8. Graph $y = \ln (x + 1)$. Find domain, range, and intercepts.

D:

R:

x-intercept(s):

y-intercept(s):



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9. Name the transformation that takes place from $y = \ln x$ to

a. $y = \ln x + 3$

b. $y = \ln (x + 3)$

c. $y = \ln (-x)$

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10. Let $a = \ln x$, $b = \ln y$ and $c = \ln 2$. Find each of the following in terms of a , b , & c :

a. $\ln \left(\frac{x^2 y^2}{2} \right)$

b. $\ln (\sqrt[3]{xy})$

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VG Pg. 387

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____



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