PROPERTIES OF LOGARITHMS

Name Key
Date _____

Product Property: $\log_b(m \bullet n) =$ $\log_b m + \log_b n$

Quotient Property: $\log_b\left(\frac{m}{n}\right) =$ $\log_b m - \log_b n$

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

Examples

Expand each expression.

1. $\log_4 5x$

$= \log_4 5 + \log_4 x$

2. $\log_8 x^2$

$= 2\log_8 x$

3. $\log_2\left(\frac{x}{3}\right)$

$= \log_2 x - \log_2 3$

4. $\log 12x^3$

$= \log 12 + 3\log x$

5. $\log_6\left(\frac{5x^3}{6}\right)$

$= \log_6 5x^3 - \log_6 6$

$= \left[\log_6 5 + \log_6 x^3\right] - \log_6 6$

$= \left[\log_6 5 + 3\log_6 x\right] - 1$

6. $\log_2\left(\frac{\sqrt{2}x}{2}\right)$

$= \log_2 \sqrt{2}x - \log_2 2$

$= \left[\log_2 \sqrt{2} + \log_2 x\right] - 1$

$= \frac{1}{2} + \log_2 x - 1$

$= -\frac{1}{2} + \log_2 x$

Condense each expression.

7. $\log_7 4 + \log_7 3$

$= \log_7 (4 \cdot 3)$

$= \log_7 12$

8. $\ln x - \ln 3$

$= \ln\left(\frac{x}{3}\right)$

9. $\log_3 (x+2) - \log_3 5$

$\log_3\left(\frac{x+2}{5}\right)$

10. $2\log x - \log(x+4)$

$= \log x^2 - \log(x+4)$

$= \log\left(\frac{x^2}{x+4}\right)$