Name : _____ Score : _____

Teacher : _____ Date : _____

Properties of Logarithms

Expand each logarithm.

1) $\log_6 \left(\frac{q}{x}\right)$

2) $\log_{11} \left(\frac{5}{6}\right)^2$

3) $\log_6 (z^5 \cdot b^4)$

4) $\log_3 \left(\frac{8^5}{5}\right)$

5) $\log_8 (8 \cdot 2)$

6) $\log_7 \left(\frac{d}{n^3}\right)$

Condense each expression to one logarithm.

7) $5\log_{11} 3 - 4\log_{11} 7$

8) $\frac{\log_5 p}{2} + \frac{\log_5 r}{2} + \frac{\log_5 q}{2}$

9) $\log_4 5 + 2\log_4 3$

10) $2\log_2 z + \log_2 y$

11) $\ln 7 + 6\ln 2 + 2\ln 5$

12) $\log_{16} m + \log_{16} w + \log_{16} s$

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$\log_6 q - \log_6 x$

2) $\log_{11} \left(\frac{5}{6}\right)^2$

$2\log_{11} 5 - 2\log_{11} 6$

3) $\log_6 (z^5 \cdot b^4)$

$5\log_6 z + 4\log_6 b$

4) $\log_3 \left(\frac{8^5}{5}\right)$

$5\log_3 8 - \log_3 5$

5) $\log_8 (8 \cdot 2)$

$\log_8 8 + \log_8 2$

6) $\log_7 \left(\frac{d}{n^3}\right)$

$\log_7 d - 3\log_7 n$

Condense each expression to one logarithm.

7) $5\log_{11} 3 - 4\log_{11} 7$

$\log_{11} \left(\frac{3^5}{7^4}\right)$

8) $\frac{\log_5 p}{2} + \frac{\log_5 r}{2} + \frac{\log_5 q}{2}$

$\log_5 (p \cdot r \cdot q)^{\frac{1}{2}}$

9) $\log_4 5 + 2\log_4 3$

$\log_4 (5 \cdot 3^2)$

10) $2\log_2 z + \log_2 y$

$\log_2 (z^2 \cdot y)$

11) $\ln 7 + 6\ln 2 + 2\ln 5$

$\ln \left(7 \cdot 2^6 \cdot 5^2\right)$

12) $\log_{16} m + \log_{16} w + \log_{16} s$

$\log_{16} \left(m \cdot w \cdot s\right)$