Name : _____ Score : _____

Teacher : _____ Date : _____

Properties of Logarithms

Expand each logarithm.

1) $\log_4 (x \cdot k \cdot h)$

2) $\log_{11} (x \cdot x \cdot n)^{\frac{1}{2}}$

3) $\log_6 (4^5 \cdot 2^6)$

4) $\log_8 (4 \cdot 2)^5$

5) $\log_3 \left(\frac{9^3}{8^5}\right)$

6) $\log \left(\frac{m^6}{z}\right)$

Condense each expression to one logarithm.

7) $6\log_9 y + \log_9 d + \log_9 z$

8) $\log_{12} 7 + 3\log_{12} 6 + 5\log_{12} 2$

9) $\log_6 7 - \log_6 9$

10) $2\log_{13} x + 3\log_{13} b + \log_{13} q$

11) $3\log_{14} w - 3\log_{14} g$

12) $\log_{11} 4 + 4\log_{11} 3$

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2) $\log_{11} (x \cdot x \cdot n)^{\frac{1}{2}}$

$\frac{\log_{11} x}{2} + \frac{\log_{11} x}{2} + \frac{\log_{11} n}{2}$

3) $\log_6 (4^5 \cdot 2^6)$

$5\log_6 4 + 6\log_6 2$

4) $\log_8 (4 \cdot 2)^5$

$5\log_8 4 + 5\log_8 2$

5) $\log_3 \left(\frac{9^3}{8^5}\right)$

$3\log_3 9 - 5\log_3 8$

6) $\log \left(\frac{m^6}{z}\right)$

$6\log m - \log z$

Condense each expression to one logarithm.

7) $6\log_9 y + \log_9 d + \log_9 z$

$\log_9 (y^6 \cdot d \cdot z)$

8) $\log_{12} 7 + 3\log_{12} 6 + 5\log_{12} 2$

$\log_{12} (7 \cdot 6^3 \cdot 2^5)$

9) $\log_6 7 - \log_6 9$

$\log_6 \left(\frac{7}{9}\right)$

10) $2\log_{13} x + 3\log_{13} b + \log_{13} q$

$\log_{13} (x^2 \cdot b^3 \cdot q)$

11) $3\log_{14} w - 3\log_{14} g$

$\log_{14} \left(\frac{w}{g}\right)^3$

12) $\log_{11} 4 + 4\log_{11} 3$

$\log_{11} (4 \cdot 3^4)$