Algebra 2

Name_____

Expanding and Condensing Logarithms

Date_____ Period____

Condense each expression to a single logarithm.

1) $3\log_9 2 - 2\log_9 5$

2) $\log_6 x + \log_6 y + 6\log_6 z$

3) $2\log_5 x + 12\log_5 y$

4) $\log_3 12 + \log_3 7 + 4\log_3 5$

5) $\log_2 5 + \frac{\log_2 6}{2} + \frac{\log_2 11}{2}$

6) $3\log_2 3 - 12\log_2 7$

Expand each logarithm.

7) $\log_7 \frac{x^4}{y^2}$

8) $\log_7 \frac{2^3}{5^2}$

9) $\log_3 \left(z\sqrt[3]{x \cdot y}\right)$

10) $\log_5 \frac{a^3}{b^3}$

11) $\log_6 \left(uv^3\right)^2$

12) $\log_4 \left(12 \cdot 7^2\right)^4$

Expanding & Condensing Logarithms Kuta ODDS

(1) $3\log_9 2 - 2\log_9 5$

$\log_9 2^3 - \log_9 5^2$ (Power Rule)

$\boxed{\log_9\left(\frac{2^3}{5^2}\right)}$ (Quotient Rule)

$\boxed{\log_9\left(\frac{8}{25}\right)}$

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(3) $2\log_5 x + 12\log_5 y$

$\log_5 x^2 + \log_5 y^{12}$ (Power Rule)

$\boxed{\log_5 (x^2 y^{12})}$ (Product Rule)

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(5) $\log_2 5 + \frac{\log_2 6}{2} + \frac{\log_2 11}{2} = \log_2 5 + \frac{1}{2}\log_2 6 + \frac{1}{2}\log_2 11$

$= \log_2 5 + \log_2 6^{\frac{1}{2}} + \log_2 11^{\frac{1}{2}}$

$= \boxed{\log_2 5 \cdot 6^{\frac{1}{2}} \cdot 11^{\frac{1}{2}}} = \log_2 5\sqrt{6}\sqrt{11} = \boxed{\log_2 5\sqrt{66}}$

(7) $\log_7 \frac{x^4}{y^2}$

$\log_7 x^4 - \log_7 y^2$ (Quotient Law)

$\boxed{4\log_7 x - 2\log_7 y}$ (Product Law)

(9) $\log_3 z\sqrt[3]{xy} = \log_3 z(xy)^{1/3}$ Defn Radical

$= \log_3 z x^{1/3} y^{1/3}$ Expnent laws

$= \log_3 z + \log_3 x^{1/3} + \log_3 y^{1/3}$ (Product Law)

$= \boxed{\log_3 z + \frac{1}{3}\log_3 x + \frac{1}{3}\log_3 y}$

(11) $\log_6 (uv^3)^2 = \log_6 (u^2 v^6)$ Expnent Law

$= \log_6 u^2 + \log_6 v^6$ Product Rule

$= 2\log_6 u + 6\log_6 v$ Power Rule

(2) $\log_6 x + \log_6 y + 6\log_6 z$ EVENS

$\log_6 x + \log_6 y + \log_6 z^6$ (Power Rule)

$\boxed{\log_6 (xy\,z^6)}$ (Product Rule)

(4) $\log_3 12 + \log_3 7 + 4\log_3 5$

$\log_3 12 + \log_3 7 + \log_3 5^4$ (Power Rule)

$\boxed{\log_3 (12 \cdot 7 \cdot 5^4)}$ (Product Rule)

$\boxed{\log_3 (5250)}$

(6) $3\log_2 3 - 12\log_2 7$

$\log_2 3^3 - \log_2 7^{12}$ Power Rule

$\boxed{\log_2 \left(\frac{3^3}{7^{12}}\right)}$ Quotient Rule

$\log_2 \left(\frac{27}{\quad}\right)$

(8) $\log_7\left(\frac{2^3}{5^2}\right)$

$\log_7 2^3 - \log_7 5^2$ (Quotient Law)

$\boxed{3\log_7 2 - 2\log_7 5}$ (Power Rule)

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(10) $\log_5\left(\frac{a^3}{b^3}\right)$

$\log_5 a^3 - \log_5 b^3$ (Quotient Law)

$\boxed{3\log_5 a - 3\log_5 b}$ (Power Rule)

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(12) $\log_4(12 \cdot 7^2)^4 = \log_4(12^4 7^8)$ Expanent Laws

$= \log_4 12^4 + \log_4 7^8$ (Product Rule)

$\boxed{4\log_4 12 + 8\log_4 7}$

$4(\log_4(4 \cdot 3)) + 8\log_4 7$

$4[\log_4 4 + \log_4 3] + 8\log_4 7$

$4[1 + \log_4 3] + 8\log_4 7 = \boxed{4 + 4\log_4 3 + 8\log_4 7}$