Properties of Logarithms - Part 2

<u>Logarithmic Form</u>

$$\log_a x = y$$

<u>Exponential Form</u>

$$x = a^y$$

<u>Properties of Logarithms</u>

1. $\log_a 1 = 0$

2. $\log_a a = 1$

3. $\log_a a^x = x$

4. If $\log_a x = \log_a y$, then $x = y$.

5. $\log_a (u \cdot v) = \log_a u + \log_a v$

6. $\log_a \dfrac{u}{v} = \log_a u - \log_a v$

7. $\log_a u^n = n \cdot \log_a u$

8. $\log_a \sqrt[n]{u} = \dfrac{1}{n} \cdot \log_a u$

9. $\log_a x = \dfrac{\log_{10} x}{\log_{10} a}$ where $a \neq 10$ (Change-of-Base Formula)

Directions: Use the properties of logarithms to expand each logarithmic expression.

1. $\log_{10} 6x$

2. $\log_6 y^4$

3. $\log x\left(\sqrt{x-1}\right)$

4. $\log_7 \dfrac{x}{y}$

5. $\log x\sqrt{y}$

6. $\log \dfrac{x^2}{y^3 z^4}$

7. $\log\left(a^2 b^3 c\right)^4$

8. $\log \sqrt{5a^6 b^7}$

9. $\log_4 \sqrt[4]{\dfrac{x-6}{3y^2}}$

Directions: Write each expression as a single logarithm.

10. $\log x + \log 7$

11. $\log x - 3\log y$

$-3\log(x-5) + \dfrac{1}{3}\log 4x$

12. $-3\log(x-5)+\dfrac{1}{3}\log 4x$

13. $4\log_7 2+5\log_7 x-6\log_7 z$

14. $\dfrac{1}{3}\big(2\log(x+2)-6\log(x-1)-3\log x\big)$