Properties of Logarithmic Functions **Name:** _____

Laws of Logarithms
Let a be a positive number, with $a \neq 1$. Let A, B and C be any real numbers with $A > 0$ and $B > 0$.

1. $\log_a(AB) = \log_a A + \log_a B$
2. $\log_a\left(\frac{A}{B}\right) = \log_a A - \log_a B$
3. $\log_a(A^C) = C \cdot \log_a A$

1. **Evaluate each expression.**

(a) $\log_4 2 + \log_4 32$

(b) $\log_2 80 + \log_2 5$

(c) $-\frac{1}{3}\log 8$

2. **Use the Laws of Logarithms to expand each expression.**

(a) $\log_2(6x) + \log_5(x^3y^6)$

(b) $\log_5(x^3y^6)$

(c) $\log\left(\frac{ab}{\sqrt[3]{c}}\right)$

3. Combine $4\log x + \frac{1}{2}\log(x+2)$ into a single logarithm.

4. Combine $3\log x + \frac{1}{2}\log y - 5\log(x^2+2)$ into a single logarithm.

Change of Base Formula

$$\log_d n = \frac{\log_a n}{\log_a d} = \frac{\ln n}{\ln d} = \frac{\log n}{\log d}$$

Use the Change of Base Formula and a calculator to evaluate the logarithm, rounded to six decimal places.

5. $\log_3 6$ 5. _____

6. $\log_7 48$ 6. _____

7. $\log_{15} 97$ 7. _____