HOMEWORK: LOG PROPERTIES

NAME: _____ DAY 4 DUE: _____

1. $\log_a 1 =$ 0	6. $\log_a(MN) =$ $\ln_a M + \ln_a N$
2. $\log_a a =$ 1	7. $\log_a\left(\frac{M}{N}\right) =$ $\ln_a M - \ln_a N$
3. $\ln 1 =$ 0	8. $\log_a M^r =$ $r(\log_a M)$
4. $a^{\log_a m} =$ m	9. $\ln e =$ 1
5. $\log_a a^r =$ r	10. $\log_a M =$ $\frac{\log_c M}{\log_c a}$

Find the exact value of each expression.

1. $\log_2 2^{-13}$

$-13 \log_2 2$

$\boxed{-13}$

2. $e^{\ln 8}$

$\boxed{8}$

3. $\log_8 16 - \log_8 2$

$\log_8\left(\frac{16}{2}\right)$

$\log_8 8$

$\boxed{1}$

4. $\ln e^{\sqrt{2}}$

$\boxed{\sqrt{2}}$

5. $\log_6 9 + \log_6 4$

$\log_6(9 \cdot 4)$

$\log_6(36) = \boxed{2}$

Use the change of base formula to evaluate the logarithm.

6. $\log_4 7 = \boxed{\frac{\log 7}{\log 4}}$

7. $\log_5 13 = \boxed{\frac{\log 13}{\log 5}}$

8. $\log_3 15 = \boxed{\frac{\log 15}{\log 3}}$

9. $\log_8 22 = \boxed{\frac{\log 22}{\log 8}}$

Expand each expression.

10. $\log_3 \frac{x}{9}$

$\log_3 x - \log_3 9$

$\log_3 x - 2$

11. $\log_7 x^5$

$5 \log_7 x$

12. $\ln \frac{e}{x}$

$\ln e - \ln x$

$1 - \ln x$

13. $\log_3 5v^3x^2$

$\log_3 5 + \log_3 v^3 + \log_3 x^2$

$\log_3 5 + 3\log_3 v + 2\log_3 x$

14. $\log_2\left(\frac{y^5}{y+3}\right)$

$\log_2 y^5 - \log_2 (y+3)$

$5\log_2 y - \log_2 (y+3)$

15. $\log_5\left(\frac{\sqrt[3]{x^2+1}}{x^2-1}\right)$

$\log_5 \left(\frac{(x^2+1)^{1/3}}{x^2-1}\right)$

$\frac{1}{3}\log_5 (x^2+1) -$

$\log_5 (x+1) - \log_5 (x-1)$

Condense each expression.

16. $2\log_3 u - \log_3 v$

$\log_3 u^2 - \log_3 v$

$\log_3 \frac{u^2}{v}$

17. $\log_2\left(\frac{1}{x}\right) + \log_2\left(\frac{1}{x^2}\right)$

$\log_2 \left(\frac{1}{x}\right)\left(\frac{1}{x^2}\right)$

$\log_2 \left(\frac{1}{x^3}\right)$

18. $\log_a x + \log_a 9 - \log_a 5$

$\log a \left(\frac{9x}{5}\right)$

19. $\frac{1}{3}\log\left(x^3+1\right) + \frac{1}{2}\log\left(x^2+1\right)$

$\log (x^3+1)^{1/3} + \log (x^2+1)^{1/2}$

$\log (x^3+1)^{1/3} (x^2+1)^{1/2}$

$\log \sqrt[3]{x^2+1}\sqrt{x^2+1}$

20. $21\log_3 \sqrt[3]{x} + \log_3\left(9x^2\right) - \log_3 9$

$\log_3 (x^{1/3})^{21} + \log_3 (9x^2) - 2$

$\log_3 x^7 + \log_3 (9x^2) - 2$

$\log_3 (9x^9) - 2$

$\log_3 9 + \log_3 x^9 - 2$

$2 + \log_3 x^9 - 2$

$\log_3 x^9$