Name: _____ Date: _____

Use the properties of logarithms to rewrite the expression in terms of log 2 and log 7.
Then use $\log 2 \approx 0.301$ and $\log 7 \approx 0.845$ to approximate the expression.

1. $\log 14$
2. $\log\left(\frac{7}{2}\right)$
3. $\log 7^{-3}$

Expand the following expressions:

4. $\log_2(3x)$
5. $\log_3(9x)$
6. $\log_2\left(x^3\sqrt{x-1}\right)$
7. $\log_3 3x^{\frac{2}{3}}y^5$
8. $\log_4 2y^2\sqrt{x}$
9. $\log\left(\frac{6}{x}\right)$
10. $\log\frac{x^2}{yz^3}$
11. $\log_2\left(x\sqrt[4]{x+1}\right)$
12. $\log_2\frac{3\sqrt{b}}{a^4c^2}$

Condense

13. $\ln 3 + \ln x - \ln y - 2\ln z$
14. $2\log_3 x + \log_3 y$
15. $\ln 4 + 3\ln x - 5\ln y$

Condense

16. $\log 5 + \log x - \log y$

17. $\ln 5 + \frac{1}{2}\ln x + 2\ln z$

18. $3\log_5 3 + 2\log_5 a - \log_5 b - 2\log_5 c$

19. $3\log_3 x - \log_3 7 - 4\log_3 y$

20. $\log_3 a - 2\log_3 b - 3\log_3 c$

21. $\log x + 2\log y + 3\log z - \log 5$

Convert Log to Exponential:

22. $\log_3(x-2) = 4$

23. $\log_x \frac{1}{81} = -4$

24. $\log a = z$

Convert Exponential to Log:

25. $x^{-3} = \frac{1}{64}$

26. $9^x = w$

27. $b^t = k$

Solve:

28. $4\left(3^{x-2}\right) - 11 = 313$

29. $5^{x-18} = \left(\frac{1}{625}\right)^{2x}$

30. $3\log_4(x+3) + 16 = 22$