Precalculus—Expanding and Condensing Logarithms Circuit Name:_____

Expand: expand the logarithmic expression **Condense**: condense into a single logarithmic expression

1. _____ answer: $\ln\left(\frac{(x-2)^5}{x^3(x+2)}\right)$ Expand: $\log(n)^{-6}$	2. _____ answer: $\ln\left(\frac{x^4y^7}{z^3}\right)$ Condense: $\frac{1}{2}(\log_5 x + \log_5 y) - 2\log_5(x+1)$
3. _____ answer: $\frac{1}{3}\log x - \frac{1}{3}\log y$ Expand: $\log_b\left(\frac{y^4\sqrt[3]{x}}{z^5}\right)$	4. _____ answer: $\ln 64(z-4)^5$ Condense: $5\ln(x-2) - \ln(x+2) - 3\ln x$
5. _____ answer: $\ln\left(\frac{x^3}{\sqrt[3]{y}}\right)$ Condense: $4\ln x + 7\ln y - 3\ln z$	6. _____ answer: $-6\log n$ Expand: $\log_4\left(\frac{64}{y}\right)$
7. _____ answer: $4\log_b y + \frac{1}{3}\log_b x - 5\log_b z$ Expand: $\ln\frac{x^4\sqrt[2]{x^2+3}}{(x+3)^5}$	8. _____ answer: $2\log_5 x - 2\log_5 y - 3\log_5 z$ Condense: $\ln x + \ln 7$
9. _____ answer: $3 - \log_4 y$ Expand: $\log_b(x^2y)$	10. _____ answer: $\ln 7x$ Condense: $\log_2 96 - \log_2 3$

11. _____ answer: 5 Condense: $\frac{1}{2}\log x - 2\log y$	12. _____ answer: $2 + 3\log x + \frac{1}{3}\log(5-x) - \log 3 - 2\log(x+7)$ Expand: $\log \sqrt[4]{x^3(x^2+3)}$
13. _____ answer: $\log_5\left(\frac{\sqrt{xy}}{(x+1)^2}\right)$ Condense: $\log x + \log(x^2-4) - \log 15 - \log(x+2)$	14. _____ answer: $4\ln x + \frac{1}{2}\ln(x^2+3) - 5\ln(x+3)$ Expand: $\log\left(\frac{100x^3\sqrt[3]{5-x}}{3(x+7)^2}\right)$
15. _____ answer: $2 - \frac{1}{2}\log_6(x+1)$ Expand: $\log\sqrt[3]{\frac{x}{y}}$	16. _____ answer: $\log\frac{\sqrt{x}}{y^2}$ Condense: $\frac{1}{2}\log_2 9 + \frac{1}{2}\log_2 5 + \log_2 x$
17. _____ answer: $\log_2\left(3x\sqrt{5}\right)$ Condense: $3\ln x - \frac{1}{3}\ln y$	18. _____ answer: $2\log_b x + \log_b y$ Expand: $\log_6\frac{36}{\sqrt{x+1}}$
19. _____ answer: $\log\frac{x(x-2)}{15}$ Condense: $2\ln 8 + 5\ln(z-4)$	20. _____ answer: $\frac{3}{4}\log x + \frac{1}{4}\log(x^2+3)$ Expand: $\log_5\left(\frac{x^2}{y^2z^3}\right)$