Name: KEY

9.3 Laws of Logs/Change of Base

Use laws of logs to expand the expression (make ugly)

1. $\log_2(2x) = \log_2 2 + \log_2 x$ OR $1 + \log_2 x$
2. $\log_2(x(x-1))$ $\log_2 x + \log_2(x-1)$
3. $\log_2(AB^2)$ $\log_2 A + 2\log_2 B$
4. $\log_3(x\sqrt{y}) = \log_3 x + \frac{1}{2}\log_3 y$
5. $\log_5 \sqrt[3]{x^2+1} = \frac{1}{3}\log_5(x^2+1)$
6. $\log\left(\frac{x^3y^4}{z^6}\right) = 3\log x + 4\log y - 6\log z$
7. $\log_2\left(\frac{x(x^2+1)}{\sqrt{x^2-1}}\right) = \log_2 x + \log(x^2+1) - \frac{1}{2}\log_2(x^2-1)$
8. $\ln\left(x\sqrt{\frac{y}{z}}\right) = \ln x + \frac{1}{2}(\ln y - \ln z)$
9. $\log\sqrt[4]{x^2+y^2} = \frac{1}{4}\log(x^2+y^2)$
10. $\ln\left(\frac{x^3\sqrt{x-1}}{3x+4}\right) = 3\ln x + \frac{1}{2}\ln(x-1) - \ln(3x+4)$

Use the laws of logarithms to condense the expression. (make pretty!)

11. $\log_3 5 + 5\log_3 2 = \log_3 160$
12. $\log 12 + \frac{1}{2}\log 7 - \log 2 = \log(6\sqrt{7})$
13. $\log_2 A + \log_2 B - 2\log_2 C = \log_2\left(\frac{AB}{C^2}\right)$
14. $\log_5(x^2-1) - \log_5(x-1) = \log_5(x+1)$
15. $4\log x - \frac{1}{3}\log(x^2+1) + 2\log(x-1) = \log\left(\frac{x^4(x-1)^2}{\sqrt[3]{x^2+1}}\right)$
16. $\ln(a+b) + \ln(a-b) - 2\ln c = \ln\left(\frac{a^2-b^2}{c^2}\right)$
17. $\ln 5 + 2\ln x + 3\ln(x^2+5) = \ln(5x^2(x^2+5)^3)$
18. $2(\log_5 x + 2\log_5 y - 3\log_5 z) = \log_5\left(\frac{x^2y^4}{z^6}\right)$
19. $\frac{1}{3}\log(2x+1) + \frac{1}{2}[\log(x-4) - \log(x^4-x^2-1)] = \log\left[\sqrt[3]{2x+1}\left(\sqrt{\frac{x-4}{x^4-x^2-1}}\right)\right]$
20. $\log_a b + c\log_a d - r\log_a s = \log_a\left(\frac{bd^c}{s^r}\right)$

Use the change of base formula and a calculator to evaluate the logarithm, correct to six decimal places.

21. $\log_2 5$ 2.321928
22. $\log_5 2$ 0.430677
23. $\log_3 16$ 2.523719
24. $\log_6 92$ 2.523658