

1 Break down

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

into an expression involving logarithms of the simplest possible arguments. (You may assume that x is positive.)

Division inside the logarithm becomes subtraction outside, and raising to a power inside becomes multiplication by a coefficient outside.

$$\log_2 \left(\frac{x^3}{x-3} \right) = \log_2 (x^3) - \log_2 (x-3) = 3 \log_2 x - \log_2 (x-3).$$

Since $x-3$ (and course x) can't be factored, this is as far as I can break it down.

2 Combine

$$2 \log_2 (x+1) - \log_2 (x+3) - \log_2 (x-1)$$

into a single logarithm.

Multiplication by a coefficient outside the logarithm becomes raising to a power inside it, addition outside becomes multiplication inside, and subtraction outside becomes division inside.

$$\begin{aligned} 2 \log_2 (x+1) - \log_2 (x+3) - \log_2 (x-1) &= \log_2 [(x+1)^2] - [\log_2 (x+3) + \log_2 (x-1)] \\ &= \log_2 [(x+1)^2] - \log_2 [(x+3)(x-1)] = \log_2 \left[\frac{(x+1)^2}{(x+3)(x-1)} \right]. \end{aligned}$$