

$$c) \log_2 \left(\frac{a}{b^2 c} \right), a > 0, b > 0, c > 0$$

$$\log_2 a - \log_2 (b^2 c)$$

$$\log_2 a - (2 \log_2 b + \log_2 c) \quad \text{Distribute negative}$$

$$\boxed{\log_2 a - 2 \log_2 b - \log_2 c}$$

$$d) \ln \left[\frac{(x-4)^2}{x^2-1} \right]^{2/3}; x > 4$$

$$\frac{2}{3} \ln \left[\frac{(x-4)^2}{x^2-1} \right]$$

$$\frac{2}{3} [\ln(x-4)^2 - \ln(x^2-1)]$$

$$\frac{2}{3} [2 \ln(x-4) - \ln[(x+1)(x-1)]]$$

$$\frac{2}{3} [2 \ln(x-4) - [\ln(x+1) + \ln(x-1)]]$$

$$\text{Distribute } \frac{2}{3} \text{ \& negative}$$

$$\boxed{\frac{4}{3} \ln(x-4) - \frac{2}{3} \ln(x+1) - \frac{2}{3} \ln(x-1)}$$

Examples: Write each expression as a single logarithm.

$$a) 3 \log_5 u + 4 \log_5 v$$

$$\log_5 u^3 + \log_5 v^4$$

$$\boxed{\log_5 (u^3 v^4)}$$

$$b) \log_4 (x^2 - 1) - 5 \log_4 (x + 1)$$

$$\log_4 (x^2 - 1) - \log_4 (x + 1)^5$$

$$\log_4 \left(\frac{x^2 - 1}{(x + 1)^5} \right) = \log_4 \left(\frac{(x-1)(x+1)}{(x+1)^5} \right)$$

$$\boxed{\log_4 \left(\frac{x-1}{(x+1)^4} \right)}$$

$$c) \log \left(\frac{x^2 - 2x - 3}{x^2 - 4} \right) - \log \left(\frac{x^2 + 7x + 6}{x + 2} \right)$$

$$\log \left(\frac{(x-3)(x+1)}{(x+2)(x-2)} \cdot \frac{x+2}{(x+6)(x+1)} \right)$$

$$= \log \left(\frac{(x-3) \cancel{(x+1)} \cdot \cancel{x+2}}{\cancel{(x+2)} (x-2) \cdot (x+6) \cancel{(x+1)}} \right)$$

$$= \boxed{\log \left(\frac{x-3}{(x-2)(x+6)} \right)}$$

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

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

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

$$\boxed{\log \left[(\sqrt[3]{x^3 + 1})(\sqrt{x^2 + 1}) \right]}$$

$$d) 2 \log_3 \sqrt[3]{x} + \log_3 (9x^2) - \log_3 9$$

$$\log_3 (3\sqrt{x})^2 + \log_3 (9x^2) - \log_3 9$$

$$\uparrow$$

$$(x^{1/3})^2 = x^{2/3}$$

$$\log_3 x^{4/3} + \log_3 (9x^2) - \log_3 9$$

$$\log_3 \left(\frac{x^{4/3} \cdot 9x^2}{9} \right) = \boxed{\log_3 x^9}$$